



# RIO Country Report

## France 2014

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2015



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JRC 96577

EUR 27329 EN

ISBN 978-92-79-49239-6 (PDF)

ISSN 1831-9424 (online)

doi:10.2791/691199

Luxembourg: Publications Office of the European Union, 2015

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Abstract

The report offers an analysis of the R&I system in France for 2014, including relevant policies and funding, with particular focus on topics critical for two EU policies: the European Research Area and the Innovation Union. The report was prepared according to a set of guidelines for collecting and analysing a range of materials, including policy documents, statistics, evaluation reports, websites etc. The report identifies the structural challenges of the French research and innovation system and assesses the match between the national priorities and those challenges, highlighting the latest policy developments, their dynamics and impact in the overall national context.

## **Acknowledgments**

The report draft has benefited from comments and suggestions of Caroline Bélan-Ménagier from the Department of Higher Education and Research Area Strategies, Ministry for Higher Education and Research and of Thomas Zacharewicz from JRC-IPTS. The contributions and comments from DG RTD and JRC-IPTS are also gratefully acknowledged.

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## Executive summary:

**Chapter 1** gives an overview on the French research and innovation system. France's GERD has kept on growing since 2006 and reached €47.2b in 2013, which represents 17.2% of the total EU28 expenditure. GBAORD has been decreasing since 2009, from €17.5b to slightly below €14.8b in 2014. In 2012, GERD to GDP ratio was 2.23%, above EU28 average (2.02%). France's research and innovation system is characterised by a satisfactory level of public investment and a relatively low level of investment by companies (though increasing from 2008 onwards, and reaching its peak in 2013 at 1.44% of GDP). The latter is explained by the French industrial structure. Better linking public and corporate research remains a key objective of the recent research and innovation policy. To pursue this goal, France should promote an increase in business R&D intensity and innovative start-ups. A specific focus is also placed on improving the support for the use of academic research outcomes in a business perspective. At the policy-making level, two main government ministries share the responsibility for research and innovation policy in France: the Ministry for Primary, Secondary and Higher Education and Research (MENESR) and the Ministry for the Economy, Industry and Digital Affairs (MEIN). In addition, the High Commission for Investments, which is placed under the direct authority of the Prime Minister, has a complementary role. Governance changes, including a modification of the new Law on Higher Education and Research (adopted on 22 July 2013), stem from the analysis according to which France-based research and innovation stakeholders do not develop enough synergistic relationships. The French research and innovation system is organised around a number of agencies, mainly the National Research Agency (ANR); Bpifrance, the new public investment bank (as of 31 December 2012), which provides support for R&D and innovation projects to businesses, especially SMEs (companies up to 5,000 employees are included); the Agency for Environment and Energy Management (ADEME), which was created in 1991 to support and fund environment and energy research on a partnership basis. Moreover, the CGI (Commissariat général à l'investissement) has implemented the Investments for the Future Programme (PIA – Programme d'investissements d'avenir). Public research organisations (PROs) such as the CEA or CNRS also contribute to policy implementation. Research and innovation policies are also defined and implemented at the regional level. As part of the European Cohesion Policy for 2007-2013, each French region has developed its own regional innovation strategy (RIS3) – smart specialisation – with the aim of ensuring a more effective steering of its regional innovation system.

**Chapter 2** presents the recent developments of the French research and innovation policy. The new Law on Higher Education and Research, adopted on 22 July 2013, includes the design of a new national strategy for research, incorporated into "France Europe 2020", a strategic agenda for research, technology transfer and innovation. Research and innovation have become the stepping stones of many policies aiming at regaining competitiveness. The rise of competitive funding is a clear feature of the French RIS since 2005. The establishment of the ANR (Agence nationale de la recherche) in 2005 has been essential in this transformation; and so has been the implementation of the Investments for the Future Programme. As a consequence, competitive funding of public research is increasing. The share of thematic vs. generic funding for research can be observed through budgetary

lenses: about one third of the €16b funding goes to thematic areas, whereas two thirds are unspecified or multi-disciplinary. France is characterised by a high level of R&D indirect government funding. However, it does preserve a good balance in terms of size and type of firms. The current legislative evolutions, which contrast with the European research policy framework, alter many traits of the French RIS. Research institutions' staff and governance bodies get increasingly accustomed to the idea of being part of a system that should be effective since the society asks for it. A consensus is starting to emerge on two specific issues: the autonomy of the various components of the R&I system and the evaluation of institutions and processes. We pay particular attention to both the latest two National Reform Programmes and policy developments related to Council Country Specific Recommendations.

**Chapter 3**, national progress towards the realisation of ERA is evaluated, with a focus on three specific ERA priorities: the improvement in transnational cooperation and competition; the opening of the labour market for researchers; and the eased circulation, access to and transfer of scientific knowledge including *via* digital ERA. Efforts are being made on these three areas, with particular emphasis on the effectiveness of the RIS.

**Chapter 4** assesses national progress made regarding the innovation union key policy actions, i.e. in terms of (i) framework conditions; (ii) science-based entrepreneurship; (iii) knowledge transfer and open innovation; (iv) innovation framework for SMEs; (v) venture capital markets; and (vi) Innovative public procurement. According to the assessment, important progress is being made, with simplified organisations, increase of financial efforts and a significant change in the paths to reach the innovation union ambitious objectives. Important efforts to improve the performance of knowledge transfer and open innovation, a long-lasting well-known weak point of the French research and innovation system are being done. It is too early to tell if the chosen path, combining public-private partnership, heavy public support, and commercialisation structures, is as successful as envisaged.

**Chapter 5** proposes an assessment of the performance of the national research and innovation system and identifies four structural challenges faced by the national innovation system. France has an average innovation performance in Europe, and this has been the case for many years. This is a mediocre ranking given the national investments and efforts. According to international regular rankings, which account for innovation inputs to monitor global economic and innovation performance, the country's performance can be described as declining. As a consequence, there has been a deep renewal of the research and innovation policies. Policymakers' approach to this problem has changed considerably in the last two to three years. First, the whole system is accountable: there is not one single evident cause and systemic issues require systemic policy measures. Second, the competitiveness is thought to be a key economic objective, as stated in the National Pact for Growth, Competitiveness and Employment (November 2012). The connection with the innovation and research system is made explicitly in the France Europe 2020 Strategic Agenda (May 2013). We identify four structural challenges and matching policy action lines: insufficient culture of innovation (including risk aversion and lack of trust); unsatisfactory relationships between the education system and the business and industrial world; lack of efficiency of technology and knowledge transfers to industry; limited use of evaluation and assessment tools to monitor socioeconomic impacts of research and innovation policies.

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# **1. Overview of the R&I system**

## ***1.1 France in the European RDI landscape***

With above 66 million inhabitants in 2014, France is the second largest country of the EU28 after Germany. It is home to 13% of the total EU28 population. The 2008 economic crisis has affected France's Gross Domestic Product (GDP) growth rate, as it has in other EU countries, albeit less severely. In 2007, the GDP growth rate was 2.4%, but this fell sharply to 0.2% in 2008 and even plunged to -2.9% in 2009. But, unlike other countries which quickly recovered after the plunge, France's GDP growth stood at 0.3% in 2012 and 2013. Foreign trade contribution to GDP growth stood at 0.1% in 2013 but decreased and even turned negative in 2014, at -0.3%.

In terms of R&D expenditures, France's GERD has kept on growing since 2006. Within the EU28, France ranks second after Germany. France's GERD stood at €43.5b in 2010, €45.1b in 2011, €46.5b in 2012 and €47.2b in 2013, which represents 17.2% of total EU28 expenditure (as compared with the share of Germany: 30.2%).

The GERD to GDP ratio was 2.23% in 2013. France ranks 7th, above the EU28 average (at 2.01% in 2013); even though the R&D intensity has sharply decreased since the 1990s (it stood at 2.27% in 1992). This contrasts with the increase of BERD to GDP from 2007 (1.27%) to 2013 (1.44%, a peak). Total GBAORD has been decreasing since 2009, from €17.5b to below 14.8b in 2014. In terms of percentage of GDP, a steady decrease is apparent over the same period, from 0.93% to 0.7% in 2014. In recent years, the total GBAORD as a percentage of GDP tends to be comparable with the EU average while following a reverse trend.

## ***1.2. Main features of the R&I system***

Overall, France's research and innovation system is characterised by a satisfactory level of public investment and a relatively low level of investment performed by companies.

A key objective of the recent research and innovation policy is to better link public and corporate research, coupled with the need to reach a higher competitiveness level. Dynamically enhanced linkages allow cross-fertilisation, whereby companies can benefit from highly differentiating applied knowledge, and public research from sources of funding and key research questioning. A specific focus is placed on improving the support for the exploitation of research outcomes in a business setting.

Two reasons for this unsatisfactory level of private investment in France are usually put forward. The main reason is the sectorial distribution of the French economy, with R&D intensive sectors insufficiently represented in the productive structure. From a policy perspective, France suffers from a lack of mid-tier enterprises (ETI) which are likely to rely a lot on research and innovation to continue growing.



The country's lowest weight of the industry in the GDP as compared with Germany for instance (it holds when compared with other OECD countries) fully explains its lower R&D intensity<sup>1</sup>, despite recent increase.

Indeed, the evolution of R&D intensity in France between 2001 and 2011 is noteworthy<sup>2</sup>: it declined from 2001 to 2007 and then started to rise again until 2011, eventually reaching a slightly higher level than in 2001. As the intensity is measured by the ratio between R&D expenses and the value added, deindustrialisation may have simultaneously two opposite effects:

- An increased intensity, as the value added is reduced while the R&D continues to increase;
- A reduced intensity, as the weight of manufacturing sectors in the GDP decreases.

The increased intensity observed over the period results from two effects:

- An "intensity effect": some sectors experienced an increase in intensity, while the industrial structure remained untouched;
- A "structural effect": the sectorial structure evolved towards an increase in intensity; the share of production sectors with an increasing intensity increased or the share of production from sectors with a declining intensity had a lower weight.

Statistical analysis shows that the R&D recovery resulted mainly from an increase in the intensity of numerous sectors. The biggest growth was registered in the computer, electronics and optics, automotive and pharmaceutical industries. Since 2008 these increased R&D efforts were stronger than the deindustrialisation. Since 2009 the share of manufacturing sectors in the R&D intensity has further improved.

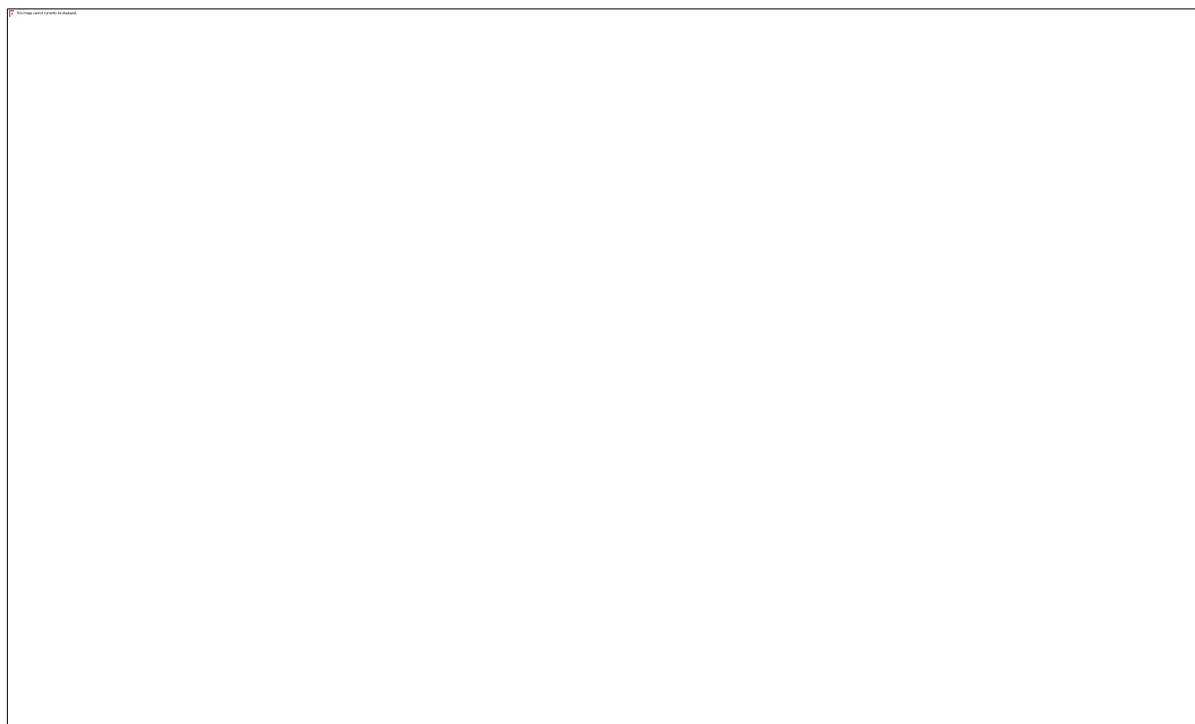
The evolution of business R&D over the same period can be better explained by simulating the theoretical evolution of R&D expenditures as if there was no intensity effect: the increase in the R&D effort would be the consequence of deindustrialisation. The purple curve in the graph below illustrates this theoretical evolution; on the same graph, the blue curve is the actual R&D trend.

**Figure 1. Amount of private R&D observed and simulated to account for deindustrialisation and the R&D tax credit, 2002-2011.**

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1 OECD Reviews of Innovation Policy: France 2014; MESR (2012), « Un déficit d'effort de recherche des entreprises françaises ? Comparaison France – Allemagne », Note d'information 12.09, juillet.

2 The following description derives from « Développement et impact du crédit d'impôt recherche : 1983-2011 », MENESR, avril 2014, pp. 40-48.



In 2011, the R&D expenditures reached a peak at €28.8b. Without increased efforts from companies, and thus if the expenditures were resulting from deindustrialisation only, R&D would be estimated at €17.7b: a gap of €11.1b.

This suggests that the modest performance of French industry in innovation is due to the size of the industry rather than to the type of innovation. Policy efforts aiming at improving R&D intensity derive partially from that.

The branches which invest most in R&D are the pharmaceutical, the automotive and the aerospace construction; they account altogether for 36% of BERD (2012).

In 2014, close to 30% of the government budget outlays for research and development (GBAORD) were allocated to four objectives: the exploration and exploitation of space (9.8%), health (7.3%), defence (6.6%) and energy (5.8%). The French spending on the first two objectives is especially high compared to the EU average and represents a national characteristic (Eurostat).

The French R&I system relies on a mix of a powerful central government at national level, working with regional and devolved institutions on specific topics. In practice, interactions between the regional authorities and the central government are organised through seven-year contracts called State-Region Plan Contracts (CPERs). A CPER sets out the financial aid provided by the central government to meet regional policy objectives. One chapter of these contracts is dedicated to research and innovation. The design of the new generation of CPERs has been harmonised with the European Structural Funds programmes (2007-2013; 2014-2020, *cf.* smart specialisation strategies). CPERs focus on competitiveness, on attractiveness of territories as places to do business, on the promotion of sustainable development and on territorial and social cohesion.

Hence, research and innovation policies are also defined and implemented at regional level. Even though regions have increased their budgets dedicated to research, technology transfer and innovation by 42% since 2007, regional funding remains limited when compared with national funding<sup>3</sup>. In 2013, French regions (i.e. regional councils) devoted approximately €918m to research and technology transfer; that was about 68% of the total spending of all local authorities. The overall budget of local authorities (i.e. regions, departments, municipalities) amounted to €1.34b in 2013. Regional and local authorities have their own budgets and they have been granted autonomy for deciding the amount they spend on R&D support.

As part of the European cohesion policy for 2007-2013, each French region has developed its own regional innovation strategy (RIS3) with the aim of ensuring a more effective steering of its regional innovation system. The design of RDI policies at sub-national level is in the responsibility of regional councils, which may be supported in the implementation stages by regional innovation agencies. Regions are allowed to develop a Regional Research Strategy (SRR) or a Regional Research and Higher Education Strategy (SRESR).

### ***1.3. Structure of the national research and innovation system and its governance***

#### **1.3.1. Research and innovation governance**

The governance of the French research and innovation system has been evolving over the last ten years with the objective of clarifying the system's functions, so as to improve its performance. This clarification implies three levels of action, namely: i) policy-making, ii) implementation (funding and programming) and iii) execution (enforcement of regulation). Thanks to simplified missions of execution mechanisms at each level, evaluation may also be facilitated. A specific mission of evaluation of innovation policies (including R&D tax credit and the competitiveness cluster policy) has been assigned to the General Commission for Strategy and Economic Foresight by the Prime Minister, on 4 November 2013<sup>4</sup> and a related committee was installed. Even though it is a high-level policy function, in practice the evaluators have to be present at each level.

At the policy level, two main ministries share the responsibility for research and innovation policy in France. In addition, under the direct authority of the Prime Minister, the highly endowed High Commission for Investments (CGI) plays a complementary structuring role.

– The Ministry for Primary, Secondary and Higher Education and Research (MENESR) designs and coordinates research policy. It is assisted by a consultative body: the Strategic Research Council (established on 19 December 2013, which replaced both the High Council for Science and Technology –HCST– and the Higher Council for Research and Technology – CSRT). According to the new Law on Higher Education and Research (July 2013), the implementation of the National Research Strategy shall smooth the system's evolutions for the years to come (notably thanks to a multi-annual programming). The National Research

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<sup>3</sup> [http://cache.media.enseignementsup-recherche.gouv.fr/file/2015/17/4/NF15\\_412174.pdf](http://cache.media.enseignementsup-recherche.gouv.fr/file/2015/17/4/NF15_412174.pdf)

<sup>4</sup> <http://www.strategie.gouv.fr/sites/strategie.gouv.fr/files/archives/CP-Plan-innovation-OK.pdf>

Strategy was developed with the support of the Strategic Research Council. The Council is responsible for proposing the broad national strategy for research, and the Parliament for evaluating its implementation. It is chaired by the Prime Minister (or by delegation by the Minister for Research) who shall guarantee a cross-ministerial coverage.

- The Ministry for the Economy, Industry and Digital Affairs is responsible for industrial research and plays a specific role on the subject of private sector research. Innovation policies are under its responsibility (together with the Ministry for Primary, Secondary and Higher Education and Research).

The fundamental channel for research and innovation funding is the general budget of the Interministerial Mission on Research and Higher Education (MIRE). The MIRE brings together funding from the Ministry for Primary, Secondary and Higher Education and Research (MENESR), the Ministry for the Economy, Industry and Digital Affairs as well as funds from several other ministries (Defence, Culture and Communication, Ecology, Sustainable Development and Energy, and Agriculture, Agrifood and Forestry). The MENESR is the leading ministry within the MIRE and is responsible for implementing the agreed budget plan. It proposes public policy priorities for all research programmes by defining, on an annual basis, the objectives and the means necessary to achieve them. In addition, a fiscal measure is significant when it comes to encouraging industrial research: the R&D tax credit (CIR). Finally, research and higher education sectors are the main beneficiaries of the Investments for the Future Programme (PIA), with the High Commission for Investments.

Governance evolutions, including a modification to the Law on Higher Education and Research adopted on 22 July 2013, stem from the judgment according to which research and innovation stakeholders do not develop synergetic enough relationships. One of the dominant objectives underlying the recent modifications in the research and innovation structures and governance is improving the connections within the system. In recent years, new groupings were implemented, often public-private, combining knowledge creation and knowledge transfer, university education and training and business activities. Part of the solution sought by the French research and innovation policymakers is emulating the knowledge triangle. On the research and higher education side, this movement is well illustrated by the creation of 27 research and higher education clusters (PRES), from April 2006 to 2013; in 2013-2014, the latter were replaced by the Higher Education Institutions and University Communities (COMUE). These groupings, which include one or more universities as well as public research organisations (PROs), shall be better equipped to develop efficient strategies; they will also simplify greatly contractual relationships with central government in reducing the number of contracts to 30 (compared to a hundred beforehand). A similar concern, looking for efficiency through cluster policy, underpinned the launch of the competitiveness clusters (*pôles de compétitivité*) in 2005, as a new form of industrial policy. As of 2013, there are 71 competitiveness clusters. Since 2010, a number of schemes have been created with the same aim, many of them under the responsibility of the High Commission for Investments. Autonomous collaboration between research, higher education and innovation organisations gave birth to new long lasting project-like structures such as: Excellence Initiative (Idex), Excellence Equipments (Equipex), Excellence Laboratories (Labex), University Hospital Institutes (IHU) dedicated to health research, Institutes of Technological Research (IRT), Energy Transition Institutes (ITE) to quote some.

Pure coordination bodies (umbrella organisations) were also created such as the five research Alliances (2010)<sup>5</sup>, covering large scientific domains (environment research, energy research, digital research, health and well-being research, social sciences and humanities). In 2013 they were solicited (together with CNRS) for a new mission: to participate in the design and prioritisation of national research and innovation grand challenges so as to assist in the implementation of the new National Research Strategy<sup>6</sup>.

At operation level, the French research and innovation system is structured around a number of agencies. The vast majority of public financing of research (and of higher education) originates from a single interministerial budget, the MIREs (Mission interministérielle recherche et enseignement supérieur). It encompasses ten large programmes; half of them are being run by the Ministry for Primary, Secondary and Higher Education and Research, while the budget is implemented through hundreds of so-called operators, i.e. agencies. Concerning research, about 45 operators account for 87% of the credits allocated (*cf.* Table 1 below).

**Table 1. The 45 main research agencies**

Higher education and agricultural research (14)
Multidisciplinary scientific and technological research (11) <ul style="list-style-type: none"> <li>• Académie des technologies</li> <li>• ANR - Agence nationale de la recherche</li> <li>• CEA - Commissariat à l'énergie atomique et aux énergies alternatives</li> <li>• CNRS - Centre national de la recherche scientifique</li> <li>• Génopole</li> <li>• IHEST - Institut des Hautes Études pour la Science et la Technologie</li> <li>• INED - Institut national d'études démographiques</li> <li>• INRIA - Institut national de recherche en informatique et en automatique</li> <li>• INSERM - Institut national de la santé et de la recherche médicale</li> <li>• IPEV - Institut polaire français Paul-Émile Victor</li> <li>• OST - Observatoire des sciences et techniques</li> </ul>
Culture research and scientific literacy (1)
Resources management research (6)

<sup>5</sup> Cf. [http://cache.media.enseignementsup-recherche.gouv.fr/file/2010/84/2/5\\_alliances\\_pourameliorer\\_la\\_reactivite\\_du\\_systeme\\_147842.pdf](http://cache.media.enseignementsup-recherche.gouv.fr/file/2010/84/2/5_alliances_pourameliorer_la_reactivite_du_systeme_147842.pdf); see also <http://www.senat.fr/rap/r10-453/r10-4531.pdf>

<sup>6</sup> As an illustration of the contributions, here is a link towards that of ANCRE (French National Alliance for Energy Research Coordination): [http://www.allianceenergie.fr/iso\\_album/ancre\\_snr.pdf](http://www.allianceenergie.fr/iso_album/ancre_snr.pdf) [in French]

<ul style="list-style-type: none"> <li>• BRGM - Bureau de recherches géologiques et minières</li> <li>• CIRAD - Centre de coopération internationale en recherche agronomique pour le développement</li> <li>• IFREMER - Institut français de recherche pour l'exploitation de la mer</li> <li>• INRA - Institut national de la recherche agronomique</li> <li>• IRD - Institut de recherche pour le développement</li> <li>• IRSTEA - Institut national de recherche en sciences et technologies pour l'environnement et l'agriculture</li> </ul>
<p>Sustainable mobility, development and energy research (3)</p> <ul style="list-style-type: none"> <li>• IFP Energies nouvelles</li> <li>• IFSTTAR - Institut français des sciences et technologies des transports, de l'aménagement et des réseaux</li> <li>• IRSN - Institut de radioprotection et de sûreté nucléaire</li> </ul>
<p>Higher education and research related to the economy and industry (9)</p> <ul style="list-style-type: none"> <li>• Ecoles des mines (6 )</li> <li>• GENES - Groupement des écoles nationales d'économie et statistique</li> <li>• Institut Mines-Télécom</li> <li>• SUPELEC - Ecole supérieure d'électricité</li> </ul>
<p>Spatial research</p> <ul style="list-style-type: none"> <li>• CNES - Centre national d'études spatiales</li> </ul>

**Source :** [Rapport général fait au nom de la commission des finances sur le projet de loi de finances pour 2015, adopté par l'assemblée nationale, Tome III, annexe n° 24 ; recherche et enseignement supérieur, p 72.](#)

Details of some of the most influential agencies are given hereafter.

- The **National Research Agency** (ANR) was created in 2005 to fund research projects on a competitive basis and through public-public and public-private partnerships. According to budgetary sources (Senate, Finance Law 2014), the ANR received a budget of €656m for 2013 (a €80 million reduction as compared with 2012). The ANR covers basic research, applied research, innovation and technology transfer. At the beginning, it was designed to give a new impulse to the French research and innovation system through: i) the development of new concepts through exploratory research with the so-called “white programmes” (*programmes blancs*) which are non-thematic calls, ii) boosting research on economic and social priorities through thematic calls for projects; iii) promoting collaboration between public and private research through collaborative research, and iv) increasing international partnerships. Since 2010, the ANR is also the operating agency of

the High Commission for Investments, in relation to the actions of the Investments for the Future Programme in the field of higher education and research. Since 2014, ANR has stopped funding research according to “white programmes”. The new policy is to launch mainly “generic calls for projects” (about 69% of the agencies yearly programme). The latter are designed to implement the Ministry’s programming; which corresponds to the priorities of the National Research Strategy.

- The **Agency for Environment and Energy Management (ADEME)** was created in 1991 to support and fund environment and energy research on a partnership basis (with a budget of €1b in 2010). ADEME is a dedicated public agency with the responsibility to promote innovation in the field of environment. ADEME’s missions consist in promoting, supervising, coordinating, facilitating and carrying out activities aiming at protecting the environment and improving energy savings.

- **Public research organisations (PROs)** such as the National Centre for Scientific Research (CNRS, €3.3b budget in 2014), also contribute to policy implementation.

In addition to these research agencies, Bpifrance (which replaced OSEO), the new public investment bank (as of 31 December 2012), provides support for R&D and innovation projects to businesses, especially SMEs. This national agency has benefited from a €21b endowment in 2013. It is committed to promote and support the industrial development, boost SMEs growth through innovation and promote technology transfer. A network of regional correspondents and private financing partners complements the public bank organisation.

### 1.3.2. Research performers groups

In France, as in the majority of OECD countries, over 60% of the R&D is carried out by companies (65% in France in 2013). According to the latest Eurostat data, total companies’ funding of R&D amounted to €25.77b in 2012 (€24.83b in 2011), 2.9% of which went to public research performers (HEIs and government research institutions), i.e. €745m. This figure is low compared with the EU trend -4.7% in 2012. Nonetheless in 2013 the 34 Institut Carnot<sup>7</sup> obtained €455m of contract research revenues, which are comparable with that of the Fraunhofer-Gesellschaft.

The ASRC (Association des structures de recherche sous contrats / Contract Research Organisations Association) is a representative organisation that gathers a large share of the private research performers. The 40 Private research organisations of ASRC are employers of more than 2,500 doctors, engineers and technicians. Clients encompass 1,500 start-ups, SMEs, medium-sized companies and large groups. Their total yearly turnover amounts to more than 150m, corresponding to 4,000 R&D contracts. They develop collaboration with public research performers, in as much as 100 contracts per year<sup>8</sup>.

The main public research performers are higher education institutions (HEI), which comprise a group of about 80 universities (2012-2013) and a smaller number of “Grandes

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<sup>7</sup> Cf. <http://www.instituts-carnot.eu/en>

<sup>8</sup> <http://www.asrc.fr/fr/association-des-structures-de-recherche-sous-contrat-asrc/>

Ecoles". The latter are a specific trait of the French higher education system; in parallel to universities, Grandes Ecoles are allowed to select their students through a competition type of recruitment process, whereas universities cannot select students. The new Law on Higher Education and Research encourages university grouping, so there will be probably about 30 larger universities in the coming years. In 2013<sup>9</sup>, HEI (including CNRS) spent roughly €9.8b, which amounted to slightly below 21% of GERD. On the other hand, government sector's research represented €6.2b, i.e. circa 13% of GERD. Institutes and research centres in this latter group are of foremost importance to French research. They often collaborate with HEIs (see below). The National Centre for Scientific Research (CNRS) had a budget of €3.1b in 2012, while the budget for civilian research of the Alternative Energies and Atomic Energy Commission (CEA) amounted to €2.4b in 2012. Other large PROs include the National Institute for Agricultural Research (INRA), the National Institute for Computer Science and Automation (INRIA), and the National Institute for Health and Medical Research (INSERM).

### **1.3.3. Knowledge production**

The production of scientific knowledge is the core function that a research system fulfils. The French research and innovation system can be characterised by a rather high level of public investment (especially when considering indirect funding, see *infra*) and by a relatively low business counterpart. A major policy goal is to better link public and private research, and in particular to increase support for the exploitation of research outcomes.

In 2012, France's world share of scientific publications (*cf.* OST 2013 treatments of WoS and Thomson Reuters data), in material and life sciences (incl. multi-disciplinary journals) stood at 3.7%, ranking third in Europe, below Germany (5.2%) and the UK (4.7%). France held the same rank in terms of its share in citations (in a two years perspective), with 4.1% as compared to 6.5% for Germany and 6.4% for the UK. These shares have been declining since 1999, as a result of the entry of newcomers on the international scientific stage such as China, India or Brazil. With regard to patents, in 2011, France ranked as the second European Member State, according to the European system (8.0% of European patent applications at EPO; almost twice as much as the UK at third rank with 4.1%, the first holder being Germany with 22.4%) and as second European Member State according to the American system (2% of US patents granted, equal to that the UK). In both systems, France's overall share has been declining since 2004. This decrease is due to the rise of new "players" like China or South Korea.

Revenues from intellectual property (IP) are decreasing and are highly concentrated within three research organisations, namely CNRS, CEA and Institut Pasteur, which account for 90% of national revenues from IP. Universities and other HEIs suffer from a lack of institutional capacity in terms of research and patents. As a result for HEIs implementing IP strategies remain challenging. In order to overcome these weaknesses, the national policy is geared towards i) awareness raising and promotion of IP policies to public research performers and ii) the identification of a single IP manager in case of co-ownership (as set out in the Decree published in 2009<sup>10</sup>; and specified in 2014<sup>11</sup>).

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<sup>9</sup> Eurostat, 2015, provisional.

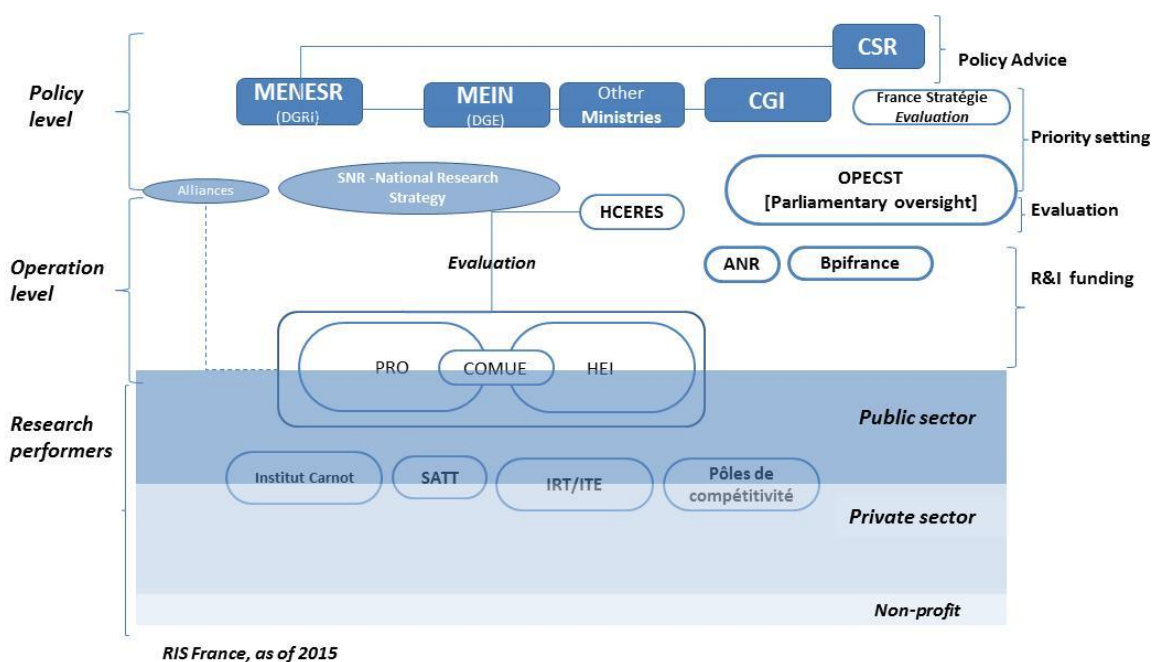
<sup>10</sup> <http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000020719576&dateTexte=&categorieLien=id>



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<sup>11</sup> <http://legifrance.gouv.fr/eli/decret/2014/12/16/MENR1416168D/jo/texte>

**Figure 2. The French research and innovation system: a simplified view**



**Table 2. Main Acronyms used in the chart above**

**ANR:** Agence nationale de la recherche / National Research Agency

**Bpifrance:** Public Investment Bank

**CGI:** Commissariat général à l'investissement / General Commission for Investments

**CSR:** Conseil stratégique de la recherche / Strategic Research Council

**COMUE:** Communauté d'universités et d'établissements / Higher Education Institutions and University Communities

**DGE:** Direction générale des entreprises au MEIN / Directorate-General for Entreprises at Ministry for the Economy, Industry and Digital Affairs

**DGRI:** Direction générale de la recherche et de l'innovation (au MENESR) / Directorate-General for Research and Innovation (within the MENESR)

**HCERES:** Haut Conseil de l'évaluation de la recherche et de l'enseignement supérieur / High Council for Evaluation of Research and Higher Education

**HEI:** Higher Education Institution

**Instituts Carnot:** Research network of 34 institutes dedicated to fostering enterprise innovation through public-private collaboration

**IRT:** Institut de recherche technologique / Technology Research Institute (Investments for the Future Programme)

**ITE:** Institut pour la transition énergétique / Energy Transition Institute (Investments for the Future Programme)

**MEIN:** Ministère de l'Economie, de l'Industrie et du Numérique / Ministry for the Economy, Industry and Digital Affairs

**MENESR:** Ministère de l'Education nationale, de l'Enseignement supérieur et de la Recherche / Ministry for Primary, Secondary and Higher Education and Research

**OPECST:** Office parlementaire d'évaluation des choix scientifiques et technologiques / Parliamentary Office for the Evaluation of Scientific and Technological Choices

**Pôles de compétitivité:** Competiveness clusters

**PRO:** Public Research Organisation / Organisme public de recherche

**SATT:** Société d'accélération du transfert de technologies / Private company (full public capital) dedicated to boosting technology transfer from universities through intellectual property

**SNR:** Stratégie nationale de recherche / National Research Strategy

## 2. Recent Developments in Research and Innovation Policy and systems

This section highlights policy and system developments that have occurred since late 2012, until the beginning of 2015.

### ***2.1 National economic and political context***

Many changes result from the new Law on Higher Education and Research, adopted on the 22 July 2013<sup>12</sup>; the latter notably includes the formulation of a new national strategy for research, as part of “France Europe 2020<sup>13</sup>”, the overarching strategic agenda. In addition to these direct developments, research and innovation have also progressively become the stepping stones of many policies aiming at regaining competitiveness. So, even though France is facing an excessive public budget deficit and a high level of debt, the government has chosen to maintain the high level of public investment in RDI, and even increase it, notably with the “Investments for the Future” Programme<sup>14</sup> 1 and 2, for as much as €47 billion (to be spent over a ten-year period, a quarter of it on research alone). Many of those investments were suggested in the National Pact for Growth, Competitiveness and Employment<sup>15</sup> (November 2012). The tax credit for employment and competitiveness (CICE)<sup>16</sup> is to be mentioned; innovation expenses are an essential part of the eligible scope<sup>17</sup>. Implemented as of January 2013, it amounted to €12b in 2013, and to €18b in 2014; €20b are foreseen in 2015. Other key measures include the creation of a national public investment bank (merger of pre-existing structures), Bpifrance, the shift of the competitiveness clusters<sup>18</sup> policy (*pôles de compétitivité*) towards the objective of delivering new products and services (vs. new R&D projects). “34 Plans for Industrial Reconquest”<sup>19</sup> were launched by the Minister for Industry on 7 October 2013; it is a by-product of the “Filières strategy” implemented by the National Industry Council. The “34 plans” partially rely on the Investments for the Future’s budget.

This variety of research and innovation-oriented measures aims at recovering competitiveness through a reduction of the cost of labour, while attempting to bring the deficit below 3% of GDP by the end of 2015. Hence, the use of tax credits, such as the new

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12 <http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000027735009&dateTexte=20130730>

13 [http://www.france-science.org/IMG/pdf/france-europe-2020\\_-\\_a\\_strategic\\_agenda\\_for\\_research\\_technology\\_transfer\\_and\\_innovation.pdf](http://www.france-science.org/IMG/pdf/france-europe-2020_-_a_strategic_agenda_for_research_technology_transfer_and_innovation.pdf)

14 [http://media.enseignementsup-recherche.gouv.fr/file/2010/19/8/Investissements\\_d\\_avenir\\_mode\\_d\\_emploi\\_146198.pdf](http://media.enseignementsup-recherche.gouv.fr/file/2010/19/8/Investissements_d_avenir_mode_d_emploi_146198.pdf)

15 <http://www.invest-in-france.org/Medias/Publications/1888/France-national-pact-for-growth-competitiveness-and-employment-2012.pdf>

16 <http://www.economie.gouv.fr/ma-competitivite/tax-credit-for-encouraging-competitiveness-and-jobs>

17 Cf. footnote 8: “As the CICE intends to finance improvements in the competitiveness of businesses through investment, research, innovation, training, recruitment, exploration of new markets, and the recovery of working capital, firms’ financial statements must reflect the fact that the tax credit has been used in pursuit of these goals.” The emphasis is ours.

18 <http://competitivite.gouv.fr/policy-of-the-clusters-906.html>

19 [http://www.redressement-productif.gouv.fr/files/nouvelle\\_france\\_industrielle\\_english.pdf](http://www.redressement-productif.gouv.fr/files/nouvelle_france_industrielle_english.pdf)

tax credit for employment and competitiveness (CICE) and the preservation of the R&D tax credit (CIR) and of large loans conditional to return on public investment (*cf.* Investments for the Future Programmes). In October 2014, France put forward an annual budget that included €21b of cuts while missing the EU deficit target, for the third time: deficit is announced to reach 4.3% of GDP in 2015. The 3% target is planned to be reached in 2017, at best.

## **2.2 National R&I strategies and policies**

The most significant changes of the research and innovation system are intertwined with the evolution of the legal policy context. The law of 22 July 2013 mainly deals with public research system changes. The new [National Research Strategy](#) (published in March 2015) contains orientations according to which research performers shall alter their research priorities in order to better meet societal challenges, in the context of the European research policy framework. The law also touches upon advisory and evaluating bodies, with the removal of both the High Council for Science and Technology (HCST) and the High Council of Research and Technology (CSRT), replaced by the Strategic Research Council (SRC, see *infra*), and with the removal of the AERES, replaced by the High Council for the Evaluation of Research and Higher Education<sup>20</sup> (HCERES) (both changes are explained in more detail in §2.4). The law also aims at improving the university system's organisation, giving groupings (i.e. "communities") the power to develop "site policies". In addition to these changes that relate to structures and institutions, the new government strengthened the research and innovation policy implemented by the former government with the influential High Commission for Investments (CGI) and a preserved R&D tax credit's architecture (see below for details).

Key policy measures are included in the new Law on Higher Education and Research, adopted on 22 July 2013. The preparation of the law has started with a consultation process of the interested parties dubbed "Les Assises" (equivalent to round table foundation process) of research and higher education, carried out from July to December 2012. The process resulted in a report<sup>21</sup> used as an input to the law. The on-going restructuring modifies components of the system's organisation and deals with technology and knowledge transfers.

The Law on Higher Education and Research of 22 July 2013 contains the main following changes:

- o *A new national strategy for research.* There will be also a strategy for Higher Education, the Ministry being responsible for developing both. To be more specific, the National Research Strategy (dubbed "France Europe 2020") is: "A National Research Strategy, with a multi-annual programming is developed and revised every five years under the coordination of the Minister for Research [...]. This strategy aims to meet the scientific, technological, environmental and societal challenges while maintaining a high level of basic research. It includes the valorisation (commercialisation) of research results

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<sup>20</sup> <http://www.hceres.fr/>

<sup>21</sup> [http://cache.media.enseignementsup-recherche.gouv.fr/file/Assises\\_esr/24/0/Assises-ESR-Rapport-Vincent-Berger-237240.pdf](http://cache.media.enseignementsup-recherche.gouv.fr/file/Assises_esr/24/0/Assises-ESR-Rapport-Vincent-Berger-237240.pdf)

[...] and oversees the development of innovation, technology transfer, capacity and expertise.

Priorities are adopted after consultation with the scientific and academic community, social and economic partners [...] relevant ministries and local authorities, in particular the regions. The Minister for Research ensures consistency of the national strategy *with that developed in the framework of the European Union*<sup>22</sup> and that sensitive information for strategic competitiveness and national interests are preserved.

Concerning the set of societal challenges that are meant to drive the National Research Strategy, the connection with Horizon 2020 is rather straightforward as the following table illustrates:

**Table 3. Correspondence table: “France Europe 2020” – “Horizon 2020” grand challenges**

#	FRANCE EUROPE 2020	#	HORIZON 2020
1	Reasoned resource management and adaptation to climate change	5	Climate action, environment, resource efficiency and raw materials
2	Clean, Secure and Efficient Energy	3	Secure, clean and efficient energy
3	Stimulating industrial renewal	KETs2	Leadership in enabling and industrial technologies [Key Enabling Technologies (KETs)]
4	Health and well-being	1	Health, demographic change and well-being
5	Food safety and the demographic challenge, biotechnologies	2	Food security, sustainable agriculture and forestry, marine, maritime and inland water research and the bioeconomy
6	Sustainable mobility and urban systems	KETs3	
7	Information and communication society	4	Smart, green and integrated transport
8	Innovative, integrating and adaptive societies	KETs1	Information and communication technologies
9	A spatial ambition for Europe	6	Europe in a changing world – Inclusive, innovative and reflective societies
10	Freedom and security in Europe	KETs4	Space
		7	Secure societies – Protecting freedom and security of Europe and its citizens

**Source:** Alain Quévieux, *Lettre européenne de l'ANRT*, #258, 2013.

The National Research Strategy and the conditions for its implementation are subject to a biennial report of the Parliamentary Office for Evaluation of Scientific and Technological Choices [...], which includes an analysis of the effectiveness of public aid to private research. [...] Multi-year contracts with research organisations and higher education

<sup>22</sup> The emphasis is ours.

institutions, the programme of the National Research Agency and other public research funding contribute to the implementation of the national strategy for research. The Parliamentary Office for Evaluation of Scientific and Technological [...] contributes to the assessment of the implementation of this strategy.”

The national strategies, one for higher education and one for research are presented by the government to the Parliament every five years, in the form of a White Paper on higher education and research. The preparation of the National Research Strategy will be a permanent process, for which a new Council is to be set up: The Strategic Research Council:

“The Strategic Research Council is responsible for proposing the broad national strategy for research and [...] involved in the evaluation of their implementation. [It] is chaired by the Prime Minister or by delegation by the Minister for Research.”

The Strategic Research Council was established on 19 December 2013, replacing the High Council for Science and Technology (HCST), founded in 2006. The Council will include 16 to 24 members, and will strictly respect gender equality. The Strategic Research Council shall meet at least once a year at the initiative of its President, who determines the meeting agenda. Meetings may also be held at the initiative of the Vice-President, including when dealing with a question of the Prime Minister or the Minister for Research.

- *“Site policy” and higher education institution groupings.* PRES (Research and higher education clusters, which used to stand for “*pôles de recherche et d’enseignement supérieur*”) are removed and replaced by Communities of Universities and Institutions (COMUE, *Communautés d’universités et d’établissements*) consisting of a board of directors, an academic council and board members. A single contract per site is to be signed with the Minister. This shall greatly simplify implementation since there will be 30 contracts instead of a hundred today. This “site contract” includes a “common component” and “the specific features of each institution”. Three types of groups are planned: the merger, the university community and the association. Current PRES have a year to change status.
- *Roles of regions.* The law transfers to regions both the mission and the budget to develop and disseminate scientific, technical and industrial culture, especially among young audiences. The regions also define “a regional plan for higher education, research and innovation, which determines the principles and priorities of its activities”; the regions’ initiatives shall fit into “the context of national strategies”. In addition, regions shall be associated with the preparation of the multi-year site contracts.
- *University governance.* One of the most remarkable and much debated novelties is the acceptance of “externals” as voters – the list of which may evolve over time – for the election of the president of the university. In addition, an Academic Council is established (chaired, or not, by the president of the university); the latter is the reunion of the Scientific Council and the Board of Studies and University Life, which is given a decisive role. The Academic Council is responsible for the allocation of resources, the adoption of rules for examinations and rules of evaluation of teaching, laboratory operation or examination of individual issues relating to recruitment, placement and career of teachers and researchers. Board composition is rebalanced in favour of students, technicians and support functions. Parity is set for the elections. A board of

directors of components (institutions parts of the whole) complement the university governance.

- *High Council for Evaluation of Research and Higher Education*. The French Evaluation Agency for Research and Higher Education (AERES) is replaced by a High Council for Evaluation of Research and Higher Education, as an independent administrative authority. The High Council is responsible for the evaluation of institutions, research units and training and it “assesses or guarantees the quality of evaluations conducted by other agencies.” Regarding staff evaluation, the High Council shall “ensure that it takes into account all of their missions.” It is run by a 30 member-board, consisting of 9 staff proposed by the evaluation bodies, 8 proposed by public research institutions, 2 student representatives, 9 qualified persons (3 of whom must come from private research) and 2 MPs.

- Regarding PhDs, and knowledge and technology transfers:

- o *PhDs*. The law requires that the competitions for civil servants “A Class” with a minimum of three years of higher education are adjusted to allow the participation of PhDs and to follow up on this through an annual report to Parliament. A new possibility is also given to PhD holders to access ENA (Ecole nationale d’administration) provided that they have at least three years of professional experience, and access ENA internal competition provided that PhD holders were funded through a “doctoral contract”. In the private sector, negotiations for the recognition of the PhD in sectorial agreements should be completed by 1 January 2016.

- o *Knowledge transfer*. The transfer of research results to the service of society is added to the mission of higher education and public research. A new book on transfer activities has complemented the Code of Research<sup>23</sup>, within a year after the publication of the law. The law provides that inventions resulting from publicly funded research should preferably be commercialised through SMEs and ETIs on European territory. This addition to the Code of Research (Book 5) specifies all legal provisions on the use of research results and on technology transfer in the business sector, and to associations and foundations of public benefit: incentives, cooperation structures, and the participation of research staff in the creation of businesses and in existing businesses and the protection of intellectual property.

The French R&I system continues its transformation, started ten years ago. Research institutions’ staff and governance bodies at large get increasingly accustomed with the idea of participating in a system that has to be effective because the society demands it. A consensus is emerging<sup>24</sup> on two specific issues where there is room for improvement: autonomy of the various components of the R&I system; evaluation institutions and

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<sup>23</sup> <http://www.legifrance.com/affichCode.do?cidTexte=LEGITEXT000006071190>

<sup>24</sup> This aspect is to be further developed in 2.7.2



processes. The framework conditions of R&I are thus being modified. Coherence between the actions implemented is at stake. Prevailing equilibria are necessarily being changed.

### ***2.3 National Reform Programmes 2013 and 2014***

Regarding R&I actions, the French Reform Programmes for 2013<sup>25</sup> and 2014<sup>26</sup> reveal a remarkable consistency, illustrated by the 2014 report. The European target of 3% of GDP invested in R&D is a systemic performance indicator, the achievement of which implies the improvement of national behaviours in many sub-domains. It is still a goal to be reached by the French R&I system. The European R&I strategy is so relevant for the French system that the correspondence of the French research agenda and of the France Europe 2020 matches perfectly that of the Horizon 2020 grand challenges. The government is and has been committed over the last years to comply with Europe 2020's objectives. Given the lack of budget flexibility, the government developed new tools such as the Investments for the Future Programme 1 and 2 and the tax credit for employment and competitiveness (CICE). These efforts confirm the French commitment to the European knowledge economy.

In National Reform Programme (NRP) 2013, three challenges are addressed (the same roughly holds for NRP 2014). First, the French research and innovation system shall become clearer so that it can be more effective. Initiatives aim at gathering forces (university groupings, including public-private excellence partnering; synergetic multi-scale and multi-sector funding; very large infrastructures articulation). Second, knowledge and technology transfer of academic research outputs to society shall be strengthened. Initiatives encourage public-private clustering logics (e.g. a dozen institutes for technological research - IRT). Third, the attractiveness of the French R&I system shall be preserved while business investments in R&D are encouraged as they are vital to French competitiveness. That explains the so-called "ring-fencing" of the R&D tax credit in its current form and the strengthening of the competitiveness cluster policy. The latter implies that the Clusters shall shift from supporting the emergence of new projects to encouraging the development and industrial launch of new products and services. Even though France has not reached the 3% target yet, the implemented package has led to steady improvements; the GERD/GDP ratio reached 2.29% in 2013 from 2.08% in 2007.

### ***2.4 Policy developments related to Council Country Specific Recommendations***

The 2013 and 2014 Council recommendations on France and the National Reform Programmes and Stability programmes for 2012-2017 emphasised a key objective that can be associated with an increase of the performance of the French research and innovation system: the improvement of non-price competitiveness (though cost-competitiveness is not excluded).

As put forward in the 2013 CSR, "[a]s regards non-price competitiveness, while the government has recently renewed its export strategy, supporting the development of export-oriented networks and partnerships would promote the internationalisation of SMEs. More generally, measures could be taken to ensure that the business environment is

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<sup>25</sup> [http://www.economie.gouv.fr/files/20130417\\_programme\\_national\\_reforme.pdf](http://www.economie.gouv.fr/files/20130417_programme_national_reforme.pdf)

<sup>26</sup> [http://ec.europa.eu/europe2020/pdf/csr2014/nrp2014\\_france\\_fr.pdf](http://ec.europa.eu/europe2020/pdf/csr2014/nrp2014_france_fr.pdf)

conducive to SMEs' growth. Despite considerable efforts deployed by firms in R&D-intensive sectors and sizeable government support (e.g. the R&D tax credit), high- and medium-high-tech sectors represent only a modest and declining share of the French economy. Hence, there is a need to foster the creation and growth of SMEs and mid-tier companies (ETI) in these sectors by improving the framework conditions that encourage innovation and entrepreneurship. The cluster policy that has been developed to link public research and private companies might also be further geared towards commercial exploitation of R&D&I, positive externalities between private companies located closely to one another and internationalisation of SMEs. In addition, PhD studies and research experience should be made sufficiently attractive to further foster linkages between private companies and research institutions."

Improvements of the framework conditions for innovation are therefore at stake.

Many measures were taken within this area of progress from 2012 up till 2014 a number of which will continue to deliver results beyond 2014. Many are consequences of the implementation of the National Pact for Growth, Competitiveness and Employment (November 2012). To mention some of them:

- The tax credit for employment and competitiveness (CICE) is in place since January 2013, and amounted to €10 billion in 2013, €15 billion in 2014 and €20 billion in 2015.

- The creation of a national public investment bank in 2012, Bpifrance, with an endowment of €21b devoted to the improvement of access to finance, in terms of capital risk and capital development (including exports) for SMEs and mid-tier companies.

- The shift of the competitiveness clusters policy, whereby the *pôles de compétitivité* should become "factories of future products and services" (vs. factories of new projects), as described by the Communication of the Council of Ministers on 9 January 2013. Although impacts are not visible yet, this shift is expected to further promote the economic impact of innovation. The clusters shall also contribute to the strengthening of the relations between SMEs and large groups, paying particular attention to the area of procurement. Efforts and progress will be more carefully monitored for the next six years, with a "contract of individual performance" for each Pole.

- "34 Plans for Industrial Reconquest" were launched by the Minister for Industry, on 7 October 2013, partially relying on the Investments for the Future budget, and as a by-product of the "Filières strategy" of the National Industry Council.

- R&D tax credit (CIR): As noted by OECD<sup>27</sup> and by the National Court of Auditors<sup>28</sup>, thanks to the R&D tax credit, average R&D costs in France become lower than most in Europe and equal to world average, thus maintaining attractiveness for R&D activities. In line with country specific recommendations, the official and comprehensive ex-post assessment of its effectiveness on R&D, taking into account the latest reforms, was

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<sup>27</sup> Cf. [http://www.oecd-ilibrary.org/science-and-technology/oecd-reviews-of-innovation-policy-france-2014\\_9789264214026-en](http://www.oecd-ilibrary.org/science-and-technology/oecd-reviews-of-innovation-policy-france-2014_9789264214026-en)

<sup>28</sup> [http://www.ccomptes.fr/content/download/60065/1491770/version/1/file/evolution\\_conditions\\_maitrise\\_credit\\_imp%C3%B4t\\_faveur\\_recherche.pdf](http://www.ccomptes.fr/content/download/60065/1491770/version/1/file/evolution_conditions_maitrise_credit_imp%C3%B4t_faveur_recherche.pdf), pp. 84-85.

published by the Ministry in July 2014<sup>29</sup>. To quote but a few evidence provided by the evaluation<sup>30</sup>:

- o There is “additionality”: 1 euro of public support triggers more than 1 additional euro of business R&D expenditures.
- o The report observed that R&D tasks outsourced to public research institutions rose sharply: the doubling of the rate of R&D tax credit for expenses assigned to public laboratories may have enabled SMEs to outsource (6 times) more R&D to public research labs.
- o In spite of the violent effects of deindustrialisation, the intensity of private R&D has increased since 2008, reaching a peak in 2012; as put forth in the report: *“If R&D intensity would have remained constant since 2001, the structural effect of de-industrialisation would have resulted in a decline of business R&D expenditures to €18b in 2011 while observed R&D expenditures in 2011 amounted to €29b. This gap of €11b is more than twice the amount of the 2011 R&D tax credit (i.e. €5.2b). From 2008 on, increased R&D in economic sectors became strong enough to cause an adjustment of the intensity of R&D at the macro level, reaching 1.48% in 2012.”* (cf. p. 47)

Overall, there are a number of satisfactory effects of the R&D tax credit, with its current design, on the framework conditions for R&D. It strengthens R&D investors by reducing the relative cost of the R&D expenses; it contains provisions that encourage public-private R&D connections. Newcomers are SMEs (including in the services sector). The overall efficiency of the R&D framework conditions does not lie only within this scheme. The quality of the research and innovation ecosystems matters more.

## 2.5 Funding trends

### 2.5.1 Funding flows

**Table 4. Basic indicators for R&D investments\* (data up until the last available year)**

	2009	2010	2011	2012	2013	2014	EU28 (2013)**	Link to the data
GDP growth rate	-3.1	1.7	2.0	0.0	0.2	-	0.1	<a href="#">GDP growth</a>
GERD (% of GDP)	2.21	2.18	2.19	2.23	2.23 (p)	-	2.07 (2012)	<a href="#">GERD as % GDP</a>
GERD (euro per capita)	665.7	672.3	692.8	712.5	-	-	530.1 (2012)	<a href="#">GERD EUR per cap</a>

<sup>29</sup> For the series of documents, see: <http://www.enseignementsup-recherche.gouv.fr/cid80816/developpement-et-impact-du-credit-d-impot-recherche-1983-2011.html>

<sup>30</sup> «Développement et impact du crédit d'impôt recherche : 1983-2011 », MENESR, avril 2014.

GBAORD - Total R&D appropriations (€ million)	17 513	16 360	16 813	15 135	14 980	14 818	90 505.611	<a href="#">GBAORD</a>
R&D funded by Business Enterprise Sector (% of GDP)	1.19	1.12	1.24	-	-	-	1.12% (2011)	<a href="#">R&amp;D funded by Business</a>
R&D funded by Private non-profit (% of GDP)	0.02	0.02	0.02	-	-	-	0.03% <sup>e</sup> (2011)	<a href="#">R&amp;D funded by PNP</a>
R&D funded from abroad (% of GDP)	0.16	0.17	0.17	-	-	-	0.19% (2011)	<a href="#">R&amp;D funded by abroad</a>
R&D funded by Framework Programmes(€ million)	-	600	700	-	-	-	-	<a href="#">RD funded by FP - France</a>
R&D performed by HEIs (% of GERD)	20.8	21.6	21.0	20.6	-	-	23.6% (2012)	<a href="#">GERD by sector of performance</a>
R&D performed by Government Sector (% of GERD)	16.3	14.0	13.9	13.6	-	-	12.2% (2012)	
R&D performed by Business Enterprise Sector (% of GERD)	61.7	63.2	63.9	64.6	-	-	63.3% (2012)	
Share of project vs. institutional public funding for R&D	6.4*	7.4*	7.0*	7.6*	10.9*	-	N/A	<a href="#">GBAORD by funding mode</a>
Venture Capital as % of GDP (Eurostat table code tin00141)	0.049	0.044	0.036	0.033	0.038	-	N/A	<a href="#">VC as % GDP</a>
Employment in high- and medium-high-technology manufacturing sectors as share of total employment	4.9	4.8	4.7	4.6	4.3	-	5.6% (2011)	<a href="#">Employment in high- and medium-high-technology manufacturing sectors as share of total employment</a>
Employment in knowledge-intensive service sectors as share of total employment	43.0	43.7	44.5	44.5	44.8	-	38.9% (2011)	<a href="#">Employment in knowledge-intensive service sectors as share of total employment</a>
Turnover from Innovation as % of total turnover (Eurostat table	-	14.7	-	-	-	-	13.4% (EU-27,	<a href="#">Turnover from</a>

code tsdec340)							2010)	<a href="#">Innovation as % of total turnover</a>
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\*: "in % of public research" cf. Anne-Cécile Ollivier, 2013, « Modalités de financement public de la RDI : recherche sur projet », in: *La recherche et l'innovation en France*, Odile JACOB

## 2.5.2 Competitive project vs. institutional allocation of public funding

Although BERD accounts for about two thirds of French GERD, business R&D is far from the 2% initial Lisbon target despite strong public support (e.g. the R&D tax credit as it is since fiscal year 2008 and direct public funding). Public funding also is below 1%. Competitive project funding is supposed to better stimulate R&D.

The rise of competitive funding is a noticeable feature of the French RIS since 2005, although it remains low according to international standards. The establishment of the National Research Agency (ANR<sup>31</sup>) in 2005 has been essential in this transformation. In spite of this role, the ANR received a reduced budget of €686.6m in 2013 (-€82m), and a reduced budget of €605.1m in 2014 (-€80m).

The government has nominated the Agency as the Investments for the Future Programme's implementing body. As such, it is responsible for steering the competitive selection and contracting processes for both Investments for the Future Programmes 1 and 2. Under Plan 1, €21.9b are dedicated to higher education and research, out of which €17.9b are to be allocated on a competitive basis. Under Plan 2 (announced by Prime Minister 12 July, 2013), the ANR became responsible for managing an additional budget of €4.015b; the latter includes projects under the following actions Excellence Equipments (Equipex), Excellence Initiatives (Idex), University Hospital Institutes (IHU) and Key Enabling Technologies (KETs).

All grants and funding allocated through the ANR, irrespective of the origin of the public money (regular outlays from the Ministry for Research or the Investments for the Future Programme), are on a competitive basis, relying on international juries of peers. That adds up to roughly €2b in 2014. Not all PROs and HEIs follow the exact research funding allocation procedures. The majority of research organisations' budgets for research go to researchers' salaries.

Some analysts consider that the Investments for the Future Programme is showing the new significance of competitive funding in the French RIS. And indeed, competitive funding of public research is steadily increasing, from 7.4% in 2009 to close to 11% in 2012 (for total expenses of about €13 billion in 2012, according to ANRT-FutuRIS calculations<sup>32</sup>).

<sup>31</sup> <http://www.agence-nationale-recherche.fr/en/project-based-funding-to-advance-french-research/>

<sup>32</sup> Cf. [http://www.odilejacob.fr/catalogue/sciences-humaines/economie-et-finance/recherche-et-innovation-en-france\\_9782738130341.php](http://www.odilejacob.fr/catalogue/sciences-humaines/economie-et-finance/recherche-et-innovation-en-france_9782738130341.php) ; NB: quoted as source in the report "OECD Reviews of Innovation Policy: France 2014"

Compared to other OECD countries<sup>33</sup>, France is a very modest user of competitive funding. For instance, national public project funding represents more than 50% of public funding to national performers in a number of European countries (e.g. Ireland, Belgium or Finland). In France though, project funding covers project activities and does not cover salaries of permanent staff. Thus, the influence of project funding on public research activities may correspond in reality to twice as much as indicated above, i.e. roughly 22%. Since most public researchers have permanent positions, an increased part of project-based funding is seen as complex. The researchers often feel that they spend too much of their time in writing and revising research proposals just to be able to do research. The latter is being often carried out by young researchers, not yet with a tenure position. At the same time, in some PROs, the search for project funding, “external fresh money”, is already compulsory since the organisation’s yearly budget – including salaries – depends on it; so, it is rather a matter of survival. Generally, the influence of project-based funding is bigger than what the percentages seem to imply; it is a key driver of the research activities despite its modest apparent value.

Nonetheless, from a system’s perspective, one may look for a greater coherence, i.e. a better connection between socioeconomic priorities and the thematic activities of the public researchers. This implies an improved tracing and readability of the public funding R&D flows. This can be obtained by the continuing progress of the evaluation system and by a new and clearer mix of multi-annual research budget programming (employment) and project funding.

Limitations of measurement are numerous, and include the lack of categories and classifications that would be needed for policy analysis. In most countries, the distinction between project and institutional funding is blurred, and delineation tricky. Without sound international comparisons of the effectiveness of the various competitive/institutional funding mixes, averages tend to be poorly significant. The standard – not to mention an optimal – mix relative to impacts of RDI is still unknown.

### **2.5.3 R&I funding**

Before listing public policy measures aiming at supporting research and experimental development and those aiming at supporting innovation in France, the difference between them need to be reminded. First, research and experimental development has an internationally recognised definition, which allows for precise delimitations (the *Frascati Manual*, OECD 2002). Second, it is also widely agreed that the results of R&D efforts, due to R&D very nature – i.e. creation and manipulation of information and knowledge – cannot be properly assumed by the one who makes efforts. Because of the positive knowledge externalities, states are allowed to use public money to favour R&D, in the hope that innovation occurs. Of course, innovation has also an internationally agreed definition (for study purposes, cf. the Oslo Manual<sup>34</sup>), but it is always a systemic output on the market (used for a price) or implemented within an organisation (process innovation). Innovation

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<sup>33</sup> Steen, J. v. (2012), “Modes of Public Funding of Research and Development: Towards Internationally Comparable Indicators”, OECD Science, Technology and Industry Working Papers, 2012/04, OECD Publishing. Nota: France is not included in this study, therefore refer to OECD Reviews of Innovation Policy: France 2014.

<sup>34</sup> <http://www.oecd.org/science/inno/2367580.pdf>

policy is therefore a policy mix likely to provide favourable framework conditions to innovators. Funding for innovation is one possibility. Some support financially and directly innovators-to-be. In this category, France has implemented bankers' actions, sustaining their clients when they take risks associated with innovation, they deliver instant cash to industrialise and sell novelties. This was how the innovation branch of Bpifrance, the public investment bank, was justified. Stimulating demand through innovative public procurement, such as the objective of reaching 2% of public procurement allocated to SMEs by 2020, is another key option.

Two additional innovation funding measures are noteworthy. The "34 Plans for Industrial Reconquest" (launched in September 2013) are meant to fund innovative projects, with "considerable growth prospects in the global economy", based upon a clearly identified strong position and an ability to develop mass production. The "Innovation 2030" Plan (launched in October 2013) is an original competition opened to international companies' project-leaders candidates (cf. below for details). Innovation, entrepreneurship and attractiveness are major drivers of competitiveness gains.

Budgets dedicated to the 34 industrial plans that compose the "New face of industry in France" are not known yet since each plan has to be based upon public-private partnerships, and public funding for innovation will derive from the proposed plans<sup>35</sup>. In any case, their "innovative nature" is doubtless: *"The initiatives underscore the new face of industry in France but also that of a new environmentally friendly, digital and inclusive society in which progress is shared by all. They are at the nexus of three broad transitions: in energy and the environment; in digital technology; and in technology and society"* (cf. *The New Face of Industry*, p. 3).

The €300m Innovation 2030 plan is a remarkable new initiative; it is a Worldwide Innovation Challenge. The innovative nature of the policy initiative itself is interesting (cf. its description, provided from the English website<sup>36</sup> dedicated to it):

"In an effort to confront the major challenges of the world of 2030, the Commission singled out a select number of key opportunities with very significant implications for the French economy. Following these efforts, the Commission identified seven goals based on pressing social concerns. These goals can be seen as seven critical pillars to put France on the road to long-term prosperity and employment. This is why the French government is launching a Worldwide Innovation Challenge. The goal is to foster talent and bring out future champions of the French economy. It will accomplish this by identifying and providing support for the growth of both French and foreign entrepreneurs whose innovation projects have significant implications for the French economy. This Challenge will encourage the talents of today in order to create the collective wealth of tomorrow, whether these talents are in France or abroad. The French government thus hopes to attract the world's best talents, so they can complete their projects in France."

In practical terms:

- On 18 April 2013: the Prime Minister commissioned Anne Lauvergeon to identify technological and industrial challenges that society will face in 2030 and to propose a

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<sup>35</sup> Cf. [http://www.economie.gouv.fr/files/nouvelle\\_france\\_industrielle\\_english.pdf](http://www.economie.gouv.fr/files/nouvelle_france_industrielle_english.pdf)

<sup>36</sup> <http://www.entreprises.gouv.fr/innovation-2030/home-innovation-2030>



method to stimulate the creativity of entrepreneurs around these challenges. Most public investment will come from the High Commission for Investments (the structure that runs the Investments for the Future Programme).

- 11 October 2013: The Commission “Innovation 2030” singled out seven ambitions based on societal expectations and growth sectors: Energy storage, Recycling of metals, Development of marine resources, Plant protein and plant chemistry, Personalised medicine, Silver economy, Big data.

- On 2 December 2013: launch of the call for proposals, under the chairmanship of the President: open to all innovators as long as they want to grow their business in France.

- On 20 March 2014: 58 projects selected for stage 2 (626 proposals received).

- Applications for phase 2 were opened from 2 October 2014 to 2 March 2015.

A 3-stage procedure, with an international jury:

- Stage 1. Seeding/priming: up to €200,000.

- Stage 2. Coaching: up to 10 times the seeding funds to develop the project further: opening of the specific call for proposals on 14 December 2014.

- Stage 3. Development (industrialising and marketing): up to 10 times as much as for stage 2.

The following summary table provides an attempt to classify public funding streams according to beneficiary types and nature (R&D, “R”, or Innovation, “I”).

**Table 5. Funding streams: from fundamental research to market innovation, by beneficiary type**

Funding for Businesses (SMEs, large companies)	Nature
R&D tax credit, by MENESR (incl. public-private)	R
Investments for the Future Programme by CGI (public-private)	R
34 Plans for Industrial Recovery (Ministry for the Economy)	
National Research Agency	I
Bpifrance (Public Investment Bank)	R
Regional funding	I
Innovation tax credit (SMEs)	I/ R
European Aids	R/I
Innovation 2030	R/I
	R/I
Funding for HEIs and PROs	
National Research Agency	R
Investments for the Future (Excellence Initiative)	R
Block funding	R
Horizon 2020	R/I



France is the OECD country with the highest level of indirect government funding of business R&D as a share of GDP. Not only is the French R&D tax credit<sup>37 38</sup> the most advantageous for companies performing R&D activities, but as analysed by the OECD (2013), it is also well designed, favouring SMEs over large groups and addressing “gazelles” needs (with the “young and growing enterprises” scheme). Its complementarity with the CIFRE scheme (public support for public-private PhDs) is also noticeable. Of course one may aspire that another type of generic and indiscriminate fiscal initiative is taken (so is the case of the OECD); but the whole point of the R&D tax credit (accounting for tight budgets) is preserving attractiveness and competitiveness through a constant support to R&D, in the hope that this will encourage innovation. The following two graphs are based on 2014 OECD data. They illustrate French characteristics in terms of direct government funding of business R&D and R&D tax incentives (indirect government funding) as percentages of GDP. On the left-hand side, the figure shows the variety of mixes implemented by States to support R&D activities on their territory. France has the highest level of R&D tax incentive. Russia offers the most advantageous system with a very modest fraction of tax incentives. Germany supports business R&D through direct aid only. The figure on the right-hand shows the evolution of forms of support for business R&D for selected countries, through a comparison between 2006 and 2011 (the bars, left-hand scale) and with the average annual growth rate between the two dates (the small red lines, right-hand scale). A majority of countries have increased tax incentives (see number of red lines above zero), some strongly: Belgium, 51% per year, France, 25%, Ireland nearly 40% per year. Conversely, Italy has reduced the latter form of incentive of nearly 10% on average each year.

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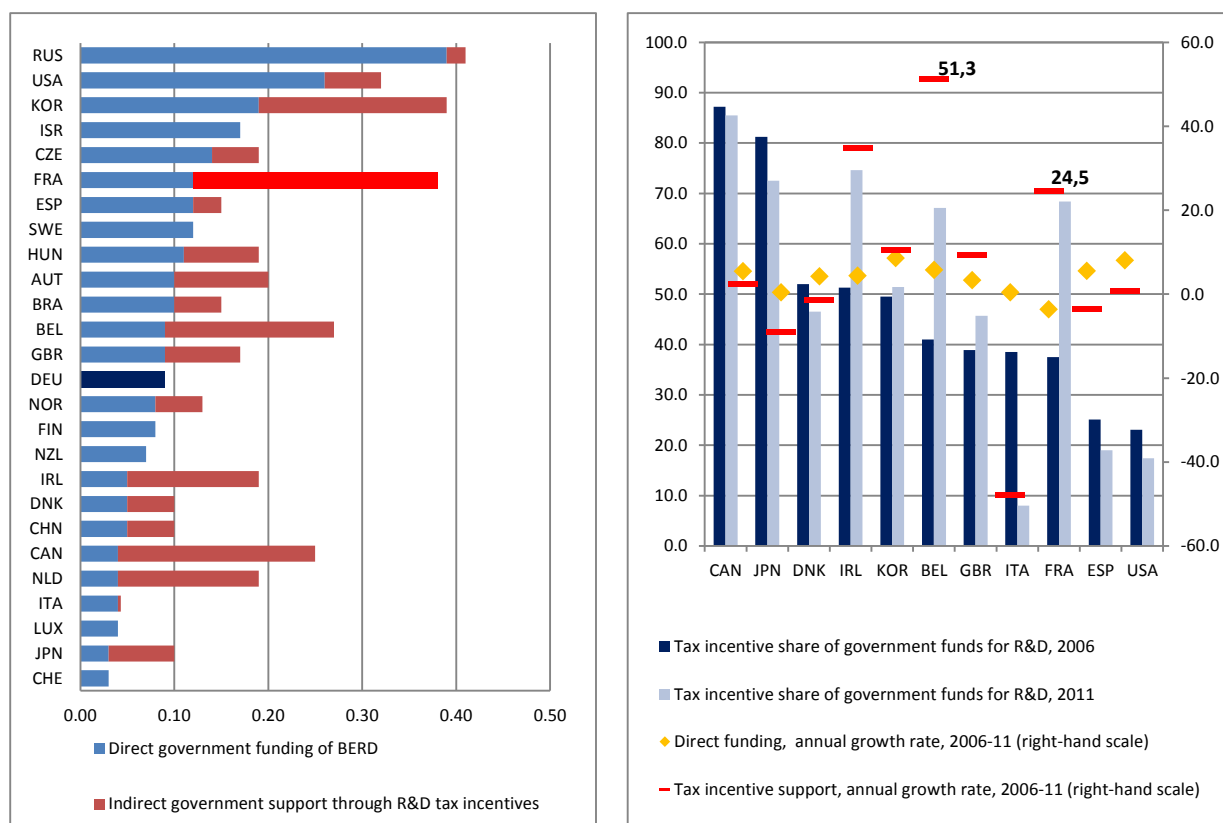
<sup>37</sup> The question of the effectiveness of the French R&D tax credit is crucial; the interested reader can find a thorough discussion on this at:

[http://www.ccomptes.fr/content/download/60065/1491770/version/1/file/evolution\\_conditions\\_maitrise\\_credit\\_imp%C3%B4t\\_faveur\\_recherche.pdf](http://www.ccomptes.fr/content/download/60065/1491770/version/1/file/evolution_conditions_maitrise_credit_imp%C3%B4t_faveur_recherche.pdf); the comprehensive econometric evaluation the R&D tax credit was published in July 2014; cf. [http://cache.media.enseignementsup-recherche.gouv.fr/file/RetD/88/0/2\\_Rapport\\_externe\\_final\\_CIR\\_2014\\_334880.pdf](http://cache.media.enseignementsup-recherche.gouv.fr/file/RetD/88/0/2_Rapport_externe_final_CIR_2014_334880.pdf) (external econometric evaluation); the report was accompanied by the synthetic and comprehensive report on the development and impact of the R&D tax credit over the period 1983-2011, cf. [http://cache.media.enseignementsup-recherche.gouv.fr/file/Rapports/85/7/1\\_Synthese\\_CIR\\_Publication\\_334857.pdf](http://cache.media.enseignementsup-recherche.gouv.fr/file/Rapports/85/7/1_Synthese_CIR_Publication_334857.pdf)

<http://www.oecd.org/publications/oecd-reviews-of-innovation-policy-france-2014-9789264214026-en.htm>

<sup>38</sup> Cf. also 2.4 above for details on the CIR (R&D tax credit scheme).

**Figure 3. Government direct funding vs. indirect R&D funding – France compared to a selection of countries**



**Source:** Data from OECD Supporting Investment in Knowledge Capital, Growth and Innovation, 2013; Science, Technology and Industry Outlook, 2014.

#### 2.5.4. Thematic versus generic funding

Respective shares of thematic vs. generic funding for research can be observed at budgetary level. In terms of R&D actually performed, French HEIs and (especially) PROs are autonomous enough to manage and implement their own research agendas. They depend on competitive project allocation of public money (see 2.5.2) which has a thematic orientation.

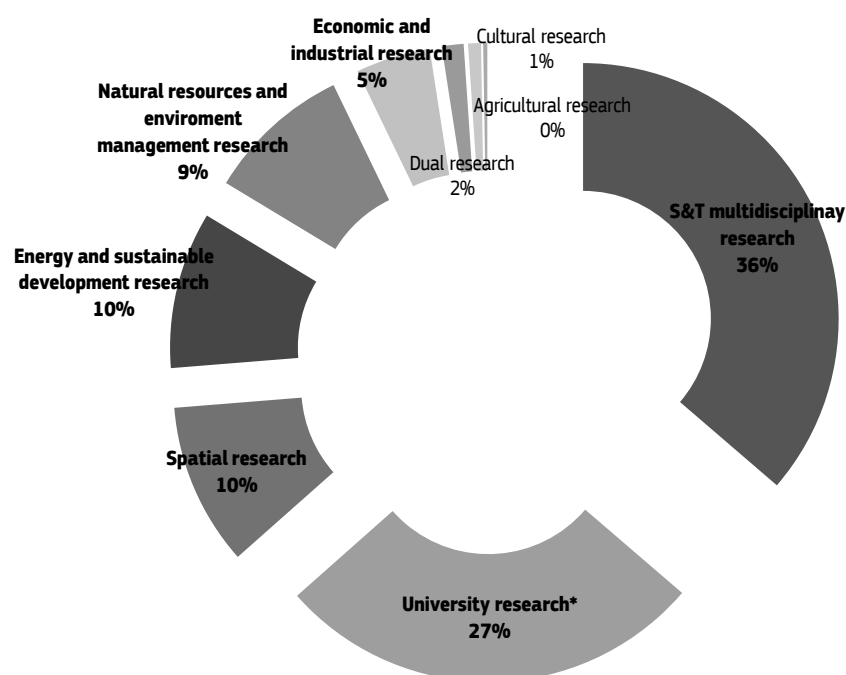
As far as programming of the National Research Agency is concerned, since 2009 there has been a significant strengthening of the generic programming (labelled “white” programming up till 2013). While generic programmes accounted for less than 30% of programming credits ANR until 2008, the government decided to increase their share, which reached nearly €290 million (48.2% of the budget) in 2010 and €278 million in 2011, representing more than half of the programming. As of 2013, the ANR do not implement ‘white programmes’ any longer. It provides funding according to the research domains chosen within the National Research Strategy. €450m were allocated to the ANR Action Plan in 2014, €310m of which were dedicated to this. The remaining €140m were allocated to specific actions.

Examining the credits allocated to the Interministerial Mission on Research and Higher Education (MIRE) gives an overall correct representation of the fiscal effort made in

favour of the various research themes<sup>39</sup>. The identification of the specific research areas is problematic. This difficulty has been amplified with the implementation of the Investments for the Future Programme (1 and 2).

The figure below gives a tentative picture of 2014 research credits split by MIREs programmes. With this simplified view, about one third of the €16b funding goes to thematic areas, whereas two thirds are unspecified or multi-disciplinary.

**Figure 4. Research credits, split by MIREs programme, as in 2014 Finance Act: €16bn**

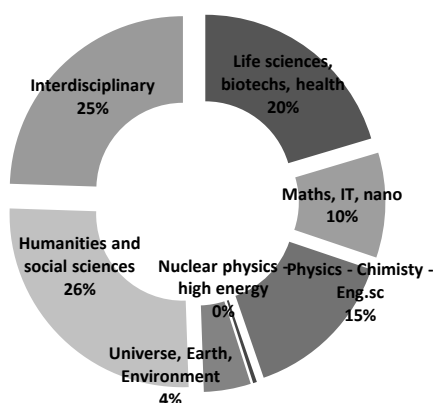


**Source:** Finance Law 2014; own calculations and presentation.\*:detailed view below, cf. Figure 4.

A detailed budgetary view of the thematic content of university research is proposed in the following figure. Altogether “Humanities and social sciences” and “Interdisciplinary research” make up for above half the research budget of the universities, i.e. slightly above €1.7b a year.

<sup>39</sup> The appraisal given here is fair though partial. MIREs includes funding dedicated to private research while a portion of public funding of thematic private R&D which is not funded by the MIREs is not presented.

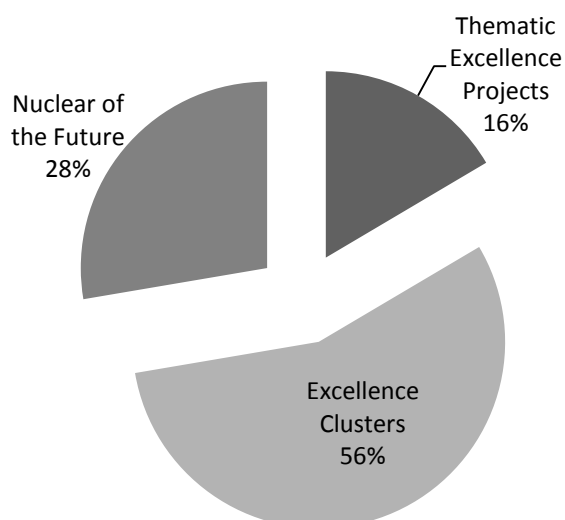
**Figure 4. University research budget split, according to disciplines, as in 2014 Finance Act: €3.78b**



**Source:** Finance Law 2014; own calculations and presentation.

Above half of €1,485m to be spent on the research part of the Investments for the Future are dedicated to “Excellence clusters initiatives”, as displayed in Figure 6.

**Figure 5. Investments for the Future Programme: research initiatives, outlays of €1,485m split by project category**



**Source:** Finance Law 2014; own calculations and presentation.

## **2.6 Smart Specialisation (RIS3)**

In France, interactions of regional, national and European research and innovation policies follow a series of principles and mechanisms. These include, seven-year contracts dubbed ‘State-Region Plan Contracts’ (Contrats de plans Etat-Région -CPER) organise most relationships, since CPERs set financial credits to meet regional policy objectives. One chapter of these contracts is dedicated to higher education and research; another is dedicated to innovation and the economy. These are two different Regional Schemes that need to be adopted by Regional Councils. Regions are currently within the 2014-2020 programming period. The design of the new generation of CPERs has been synchronised with the European Structural Funds programmes. CPERs focus on competitiveness, on attractiveness of territories as places to do business, on the promotion of sustainable development and on territorial and social cohesion.

Smart specialisation has become an important concept in French innovation regional policy. In 2013, regional stakeholders ordinarily cite smart specialisation strategies (S3) as a guiding principle for their innovation strategic plans. The need to formulate regional candidate projects for European regional funding in the framework of a smart specialisation strategy strongly encourages its use. Conditionality is an effective means for dissemination.

National public policies have also contributed to the wide spreading of smart specialisation. In the first place, the Interministerial Delegation for Territorial Development and Regional Attractiveness (DATAR) is developing public measures for supporting regions in their transition from former regional innovation strategies (SRI) towards smart specialisation strategies. DATAR issued in November 2012 a call for proposals to elaborate a didactic and methodological guide on smart specialisation for preparing future operational programmes 2014-2020 in the framework of a strategy of smart specialisation.

This guide is designed for:

Introducing the concept of “smart specialisation”,

Clarifying the function assigned to the “S3” in the implementation of the future European policies and the strengthening of their synergies,

Presenting the logic of “smart specialisation” in the vision of the next generation of policy cohesion and future operational programmes,

Identifying the evolution from regional innovation strategies to smart specialisation-based innovations strategies,

Providing step-by-step methodological elements for developing S3.

Above all, national policies have already laid bases that will foster smart specialisation. The regional innovation strategies elaborated by all French regions in 2008-2009 provide a sound stepping stone for smart specialisation. As the box “Rhône-Alpes’s innovation strategy with regard to smart specialisation for the period 2014-2020” below illustrates, French regions are now focusing on some of sub-fields of these areas.

**Table 6. Positioning of French regions according to the thematic areas identified in the RIS**

Thematic areas	Regions
Biotechnology, Nanotechnology, Life Sciences	Auvergne, Haute-Normandie, Île-de-France, Rhône-Alpes
Preservation of the environment, Management of resources, Biodiversity, Risk prevention	Alsace, Basse-Normandie, Corse, Guadeloupe, Guyane, Île-de-France, Languedoc-Roussillon, Lorraine, Martinique, Midi-Pyrénées, Nord-Pas-de-Calais, Pays de la Loire, Picardie, Provence-Alpes-Côte-d'Azur, Réunion, Rhône-Alpes
Aeronautics and Space	Guyane, Île-de-France, Corse, Midi-Pyrénées
Construction Industry	Île-de-France, Nord-Pas-de-Calais, Picardie, Provence-Alpes-Côte-d'Azur, Réunion
Mobility, Transport	Auvergne, Île-de-France, Haute-Normandie, Nord-Pas-de-Calais, Picardie, Poitou-Charentes, Provence-Alpes-Côte-d'Azur
Innovation through services, Engineering, Social Sciences and Humanities	Alsace, Centre, Guyane, Haute-Normandie, Limousin, Martinique, Nord-Pas-De-Calais, Réunion, Rhône-Alpes
Health Care	Auvergne, Basse-Normandie, Île-de-France, Haute-Normandie, Languedoc-Roussillon, Lorraine, Martinique, Midi-Pyrénées, Nord-Pas-de-Calais, Pays de la Loire, Picardie, Provence-Alpes-Côte-d'Azur, Réunion
Tourism	Corse, Guadeloupe, Languedoc-Roussillon, Réunion
Energy	Centre, Corse, Guadeloupe, Haute-Normandie, Nord-Pas-de-Calais, Pays de la Loire, Réunion, Rhône-Alpes
Materials, Mechanics, Chemistry	Basse-Normandie, Champagne-Ardenne, Guadeloupe, Haute-Normandie, Limousin, Lorraine, Midi-Pyrénées, Nord-Pas-de-Calais, Poitou-Charentes
Agrofood, Agroresources, Fishery	Limousin, Martinique, Midi-Pyrénées, Picardie, Poitou-Charentes, Réunion
ICT, Informatics, Digital, Complex Software, Electronics	Basse-Normandie, Corse, Guadeloupe, Île-de-France, Languedoc-Roussillon, Limousin, Lorraine, Midi-Pyrénées, Nord-Pas-de-Calais, Pays de la Loire, Poitou-Charentes, Provence-Alpes-Côte-d'Azur, Réunion
Creative industries	Île-de-France, Nord-Pas-de-Calais, Poitou-Charentes

Bourgogne, Franche-Comté and Bretagne regions do not appear in this thematic table as they have chosen cross-functional approaches for supporting innovation for their regional innovation strategy, such as training, networks building, etc.

Through a series of calls for projects of excellence such as Idex (Excellence Initiatives), launched in the framework of the “Investments for the Future” Programme, most regions

have already selected the scientific and technological fields they have chosen to specialise in.

In September 2013, Ile-de-France published a first version of its regional innovation smart specialisation strategy, entitled “Designing the regional version of the S3 to implement the Paris OP 2014-2020”. On 4 October 2013, Rhône-Alpes presented and published its regional innovation strategy with regard to smart specialisation. The document details the method used to construct this strategy with elements of “diagnosis of the regional innovation ecosystem”. The following box summarises some of the main dimensions of the strategy.

**Box 1. Rhône-Alpes’ innovation strategy with regard to smart specialisation for period 2014-2020**

Rhône-Alpes hosts 12 clusters and 12 “*pôles de compétitivité*”, recognised as effective or very effective. The region’s support amounts to €15m per year, which led to the completion of more than 350 innovative projects. Other key qualities mentioned are a dense economic network with high potential for technological innovation. However, among the weaknesses are cited a disappointing participation in the Seventh Framework Programme, and room for improvement for investments in public and private R&D, which are still below Lisbon targets. Finally, Rhône-Alpes is the third French region for R&D expenditures (12% of national spending) and ninth in Europe; with regard to patenting activity, the region is the second largest in France and ranks tenth in Europe.

**Method**

The Rhône-Alpes strategy was built upon the regional innovation ecosystem diagnosis. It was notably carried out through six benchmarks, including three *in situ* (Baden-Württemberg, Helsinki and Stockholm). As regards consultation and involvement of stakeholders, there have been more than 400 participants, including 20% of companies. 70 written responses were incorporated to the first version of the regional strategy established in July, before sending the final draft to the European Commission in September.

**Areas of smart specialisation**

Region Rhône-Alpes has chosen seven areas of smart specialisation where it has industrial and scientific critical mass and visibility at European level. They will be regional investment priorities until 2020. Moreover, all public support combined, 1 billion euros will be spent in total over the six years to develop the innovation strategy of Rhône-Alpes. When selecting the projects to be supported, the region will check that all stakeholders (universities and research centres, businesses, governments and consumers) are involved. The seven areas of strategic innovation are:

- Personalised medicine, infectious and chronic diseases
- Industrial and eco-efficient factory processes
- Networks and storage of energy
- Intelligent energy-efficient buildings
- Uses of technology and intelligent mobility systems
- Digital and caring systems technologies
- Sports, tourism and development of mountain

**Source:** Selected excerpts from « Stratégie d’innovation de la Région Rhône-Alpes au regard de la “Spécialisation Intelligente”. *Innover pour répondre aujourd’hui et demain aux besoins des Rhônalpins* », September 2013.

Some of the other regional innovation strategies with regard to smart specialisation were published in 2014. None of the contractual documents related to regional commitment to S3 is meant to be published in any way. Some regions may publish some of the preparatory material or the final contractual version.

## **2.7 Evaluations, consultations, foresight exercises**

### **2.7.1 A clarified evaluation system**

The organisation of the evaluation system has often been described as complex and without visible impacts<sup>40</sup>. The following paragraphs illustrate part of the recent reformation waves that have clarified and improved the system.

The High Council for Evaluation of Research and Higher Education (HCERES<sup>41</sup>, which replaces the AERES) carries out regular assessments of institutions, research units and training. Evaluation mechanisms are also internalised within large research performing organisations.

The Parliamentary Office for Evaluation of Scientific and Technological Choices (OPECST) will provide a biennial evaluation of the effectiveness of the National Research Strategy (including public aid to private research). As such, it will regularly contribute to assessing the implementation of the national strategy (Law of 22 July 2013). The National Research Strategy is to include multi-annual programming (4 years).

The National Commission for the Evaluation of Innovation Policies (installed in June 2014), sitting with France Strategy, is responsible for evaluating innovation policies (including the impact of the R&D tax credit). The national Court of Auditors publishes regular reports covering most of the research and innovation policies, which will prove complementary to those of the National Commission for the Evaluation of Innovation Policies. A member of the Court participates in the Commission.

This simplified structure results from a number of decisive advances, as the selection below illustrates.

### **2.7.2 Recent significant foresight exercises, evaluations and consultations**

From a cultural viewpoint, a noteworthy appraisal<sup>42</sup> was carried out, as of November 2012 by Jean-Luc Beylat (CEO of Alcatel Lucent Bell Labs France) and Pierre Tambourin (CEO of the Genopole). The appraisal aimed to identify options for optimising the French system of transfer and innovation, which was reported to “look like an incoherent *millefeuille*”<sup>43</sup>. On the beginning of April 2013, the report was submitted to three ministers, the Minister for Higher Education and Research, the Minister for Economic Regeneration and the Minister with responsibility for SMEs, Innovation and the Digital Economy. Entitled “Innovation, a

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<sup>40</sup> Cf. <http://www.oecd.org/sti/inno/oecd-reviews-of-innovation-policy-france-2014-9789264214026-en.htm>

<sup>41</sup> <http://www.hceres.fr/>

<sup>42</sup> Not an evaluation as such; the recommendations of the reports were to be derived from evidence.

<sup>43</sup> A common expression in the milieu when mentioning the impressive variety of R&D&I support schemes and measures; used by the Minister for Higher Education and Research in 2012.



major challenge for France<sup>44</sup>”, it proposes an original reflection on the multiplicity of levers of innovation (including taxation, culture of innovation, support structures, etc.). Although the applicability of the recommendations has been disputed, it nonetheless provides solid evidence of the relevance of a systemic approach on national innovation policy implementation issues.

In July 2012, the French government launched the so-called Assises (foundation process) on Higher Education and Research. The Assises resulted in a report which was eventually used as a basic input for the law promulgated on 22 July 2013. The consultation process involved a wide range of stakeholders. Major French HEIs and PROs contributed to it. Over the months, 106 institutions’ representatives were auditioned by the National Steering Committee; regional round tables were organised to debate the propositions; more than 3,000 organisations and individuals contributed on the website; finally, on 26 and 27 November, the concluding national round table gathered over 600 people, who debated the propositions that emerged from the regional “round tables”. The Law on Higher Education and Research built on these propositions.

The [National Research Strategy](#) (SNR) was published in March 2015. It derives from a foresight exercise managed by the Ministry for Primary, Secondary and Higher Education and Research and developed by dedicated expert groups, one for each selected societal challenge. Designing the SNR followed a process for which the basic components were: the five research Alliances and the National Centre for Scientific Research (CNRS) submitted their respective strategic roadmaps to the Ministry for Research in July 2013; in addition, a working group composed of the concerned directorates of the Ministry, ANRT and AT conducted a “state-of-the-art” and benchmark exercise related to existing national R&I agendas and international foresight exercises. Derived from their outputs, ten working groups were established. Each of them was composed by renowned experts from both public and industrial research. The expert groups proposed lists of priorities which were presented in a seminar (April 2014) and, in parallel, posted on the Ministry’s website to allow a public consultation process. Priority actions are under elaboration, some of which to be funded by Investments for the Future Programme 2.

Two additional foresight-based recent policy documents are worth mentioning: “34 Plans for Industrial Reconquest” and “A principle and 7 ambitions for innovation”.

Presented on 12 September 2013 by President Hollande, the 34 sector-based initiatives were chosen after a thorough analysis of global growth markets and a detailed examination of the role of France in each of these world markets. The preparation was supported by McKinsey in connection with the *pôles de compétitivité* and strategic committees sectors (*comités de filières*) within which companies, social partners, governments and professional associations are active. Each plan is to be run like an industrial project, with a project leader coming from the industry (in 80% of the instances) with a direct interest in the commercial success of the endeavour. The “industrial plans” deal for instance with smart grids, the 2-liter-per-100km car or biofuels and green chemistry. According to President Hollande, the plans will provide “*new ways to move around, new ways to heal us, to carry us, new ways of producing, of consuming, to feed us, to dress us...*”. Whereas the overall budget cannot be fixed beforehand, and is still not

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<sup>44</sup> [http://www.dgdr.cnrs.fr/daj/archiv-actus/2013/juin13/Docs/Rapport\\_Beylat-Tambourin.pdf](http://www.dgdr.cnrs.fr/daj/archiv-actus/2013/juin13/Docs/Rapport_Beylat-Tambourin.pdf)

known in April 2015, the Ministry for the Industry's estimate was €4 billion, when cumulating inputs from various sources, including the Investments for the Future Programme. In September 2014, the plans roadmaps were presented to President Hollande. Even though a few prototypes can be displayed, implementations along validated action lines are still expected. Detailed funding of each plan remains to be made by participants. And this is but one obstacle (the allocated €4b of Investments for the Future Programme should help), since hurdles are also legal when it comes to electric planes, drones, autonomous cars, industrial wastes recycling, etc.

The policy report "A principle and 7 ambitions for innovation" results from the Innovation 2030 Committee, chaired by Anne Lauvergeon (former president of Areva). The Committee was installed by President Hollande on 19 April 2013. The Committee's "terms of reference" were to identify sectors and technologies in which France is likely to occupy leadership positions in 2030, focusing on the activities that meet the future needs of society, create the greatest value and more jobs in France. Published on 11 October 2013, the report suggests seven "disruptive ambitions": storage of energy, recycling of materials, exploitation of marine resources (metals and desalination of sea water), vegetable proteins and plant chemistry, individualised medicine, silver economy and innovation for longevity, and big data. The proposal is also disruptive in its form since it includes an appeal to foreign investors through seven international open competitions. The latter was launched on 2 December 2013. Project leaders have three months to file a case. The winners –a few dozens– will then have a year to mature their project, supported by a grant of €200,000. In 2015, the most promising projects, eventually selected, will start. Welcoming foreign holders of projects, provided that they invest in France, is quite a break in France's usual practices. On the whole, public funding will amount to €300 million, coming from Investments for the Future Programmes 1 (started in 2010) and 2 (as of 2014), in similar proportions.

On 27 June 2014, the OECD delivered the long awaited "OECD Review of Innovation Policy: France<sup>45</sup>", commissioned by the High Commission for Investments. The report was presented by Secretary-General Angel Gurría to the Minister for the Economy at France Strategy (former General Commission for Strategy and Economic Foresight). A complete account of this report is beyond the ambition of this paragraph; it recommends finalising the structural changes partially implemented to allow more focus on excellence funding, better evaluation of the research and a closer coordination between industry and the public sector. It also recommends that universities should be strengthened, along with powerful public research organisations.

The day when the OECD report was submitted, the National Commission for the evaluation of innovation policies (*cf.* above) was officially installed. As a matter of fact, it was a governmental response to one of the OECD recommendations. This new body aims at:

Evaluating the various components of innovation policies in terms of economic impact (growth, employment, etc.)

Analysing their coherence

Making proposals to enhance their effectiveness

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<sup>45</sup> <http://www.oecd.org/fr/sti/inno/innovation-france-ocde.pdf>

Raising awareness on best practices in the areas of innovation and international policies

The commission comprises twenty members: economists (foreign and national), experts from government and local authorities, as well as innovation practitioners (innovative companies, transfer and research-industry links, and financiers of innovation).

### **3. National progress towards realisation of ERA**

#### ***3.1 ERA priority 2: Optimal transnational co-operation and competition***

The new National Research Strategy is part of “France Europe 2020”, France’s strategic agenda for research, technology transfer and innovation. It relies on a multi-annual programming revised every five years under the coordination of the Minister for Research. The priorities are to be adopted after a consultation including the scientific and academic community, social and economic partners and the regions. The Strategy must be “*coherent with that developed in the framework of the European Union*”. And indeed, given the nature and magnitude of the challenges ahead of us, no Member State can efficiently develop solutions alone. Thus, the whole set of European research instruments aimed to favour the coordination of national efforts such as ERA-NET and ERA-NET PLUS, initiatives developed thanks to Article 185 of the TFEU, as well as public-private partnerships (Joint Technology Initiatives) are vital for the EU and for France. Joining forces helps providing common answers to common problems through critical mass and better use of resources.

In order to implement joint research agendas on major challenges, France actively takes part in all 10 Joint Programming Initiatives (JPIs) launched since 2008. Its representatives are: Chair of Joint Programme – Neurodegenerative Disease Research (JPND), Chair of JPI Water, and Vice-Chair of JPI Climate as well as historical coordinators of JP Agriculture, Food Security and Climate Change (FACCE), the three-year anniversary of which was held in Paris in October 2013. French participants are partners in all the initiatives, including in Living longer and better (MYBL) as of 11 April 2014.

To ensure optimal participation of French research organisations, the Thematic Alliances (thematic research coordination bodies) were requested to represent France in the JPIs’ governing bodies (of which the National Research Agency –ANR– is part). Mirror groups have been set up to favour French stakeholders’ involvement in JPIs.

The National Research Agency has notably been established to improve the influence of the French scientific research community by developing transnational collaborations with European and international partners (non-EU). To this end, competitive and transnational projects are supported through two cooperation schemes:

Bi- or multi-lateral collaborations joint calls, through which the text of a joint appeal is negotiated and a common international evaluation committee is established. This applies both to European calls, and to other bi- and multi-lateral calls (e.g. ANR- DFG, Belmont Forum, Open research area and Open research area plus).

Regular national programmes with transnational collaborations, through which agencies agree on common methods of assessment and funding; the ANR is forging bi-lateral and multi-lateral strategic partnerships with foreign counterparts and finance transnational collaborative projects built in areas of common interest.

From its creation in 2006 1,040 transnational projects have been funded by the ANR totalling €300m. To be more specific, in 2013, 51 calls for projects were launched. 19 of them were transnational (c. 37%). There were 1,431 transnational proposals and eventually 186 projects were funded. Hence an average success rate of 13%.

**Table 7 – ANR 2013 multilateral co-funded projects (EU related projects mainly)**

Calls for projects	Topic	Submitted (count)	Co-funded (count)	ANR share of funding (€m)
ERA-NET E-RARE 2	Rare diseases	116	9	1.95
ERA-NET Biodiversa 2	Biodiversity	60	8	1.99
ERA-NET ANIHWA	Wellness and infectious and emerging animal diseases	44	7	0.98
JPND	Neurodegenerative diseases	32	7	2.52
ERA-NET Infect-ERA	Infectious diseases	66	6	2.43
PLANT KBBE with Germany (BMBF), Spain MINECO) and Portugal (FCT)	Plant genomics	39	6	1.7
Belmont Forum / G8	Coastal vulnerability / Security freshwater resource	18	6	2.54
JPI FACCE	Greenhouse gases from agriculture	14	6	0.64
ERA-NET NEURON 2	Mental diseases	48	5	1.07
ERA-NET EuroNanoMed 2	Nanomedicine	16	5	1.36
ORA Plus with Germany (DFG), United States of America (NSF), The Netherlands (NWO) and United Kingdom (ESRC)	Social Sciences	78	5	1.02
ERA-NET CHIST-ERA 2	I&C sciences	23	4	0.86
ERA-NET SIINN	Security and toxicology of nanosciences and nanotechnologies	14	3	0.81
G8-HORCs	Materials	32	3	0.86
ERA-NET M-ERA.NET	Materials	32	2	0.64
ERA-NET RURAGRI	Sustainable Agriculture	17	2	1.18
AAL 185	Ambient assisted living	5	0	0
	<b>Total</b>	<b>654</b>	<b>84</b>	<b>22.55</b>

Multi-lateral projects represent 50% of the ANR submitted transnational proposals, 45% of the co-funded proposals and 45% of the funding allocated to transnational projects.

In February 2013, France published its second national strategy for research infrastructures, which integrates current and future international commitments, including within Europe. France also participated in the update of the European Strategy on Research Infrastructures in the context of ESFRI and Horizon 2020. At organisational level, a centralised system of budgetary control on the operation and construction of facilities of national interest has been set up. A new governance system has been established, in which the chairmen of the Thematic Alliances, the CEA and CNRS participate under the guidance of the Ministry for Higher Education and Research. A high-level steering committee of very large research infrastructures decides on the national strategy for research infrastructures; it is responsible for multi-annual programming and participation in international organisations. It may seek scientific advice from the High Council for very Large Research Infrastructures.

The latest published update of the European Strategy Forum on Research Infrastructures (ESFRI) dates back to May 2011, adding six new pan-European infrastructure projects (for a total of 48 facilities). The fourth update of the ESFRI roadmap was launched in Trieste on 25 and 26 September 2014, planned to be published in 2016. The national agenda is aligned with the European's (the deadline for proposal submission was 31 March 2015).

With research infrastructures expenditures of roughly €0.8b per year (not including nuclear and space facilities), France ranks second in Europe, after Germany.

### ***3.2 ERA priority 3: An open labour market for researchers. Facilitating mobility, supporting training and ensuring attractive careers***

#### **3.2.1 Introduction**

France<sup>47</sup> ranks sixth in terms of number of publications and, by all accounts, researchers located in France benefit from some of the best research infrastructures in the world. It is an extremely opened country for young researchers since more than 40% of doctoral students in France are foreign citizens; France ranks second in the EU, after the United Kingdom, as far as PhD students from abroad are concerned. In 2012 foreign researchers accounted for about 10% and 15% of the public research institutions workforce. Since this rate is higher among new recruits, where it stands at between 15% and 30%, openness shall increase in the coming years.

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<sup>46</sup> <http://www.agence-nationale-recherche.fr/fileadmin/documents/2014/ANR-Rapport-annuel-2013.pdf>

<sup>47</sup> The figures proposed in this paragraph come from the 2013 report "L'état de l'emploi scientifique en France", *cf.* [http://cache.media.enseignementsup-recherche.gouv.fr/file/Personnels\\_ens\\_sup\\_et\\_chercheurs/41/6/EES2013\\_261416.pdf](http://cache.media.enseignementsup-recherche.gouv.fr/file/Personnels_ens_sup_et_chercheurs/41/6/EES2013_261416.pdf)

### 3.2.2 Open, transparent and merit-based recruitment of researchers

The key legal provision which addresses recruitment and careers of researchers in France is the 1983 and 1984 Decrees<sup>48</sup>, modified several times since then. Researchers are public civil servants, working according to a tenure contract within the public sector. Public sector rules apply. Hence, little is based upon individual merit and career advancement results mainly from seniority (*cf.* Articles 36 to 40). On the other hand, openness and transparency prevail when it comes to recruitment (*cf.* notably Article 22).

Permanent researchers' positions at CNRS for instance require post-doctoral experience in a research centre abroad; recruitment competitions are then open to excellent researchers from any national origin. Similar international experience is a clear advantage on the CV to apply to a university position (as a "*maître de conférence*", i.e. assistant professor) or to other French public research institution (as a "*chargé(e) de recherche*" or as a "*directeur/directrice de recherche*"). It should nonetheless be noted that university tenures may be more easily accessed with a French PhD. It is indeed required that the candidate is "qualified" by the National University Committee (Conseil national des universités). This national body, composed of both full professors and assistant professors of all the 80 disciplines, evaluates all candidates willing to apply to university tenures. Obtaining "the qualification" is a pre-requisite to access to local recruitment competitions. In a similar way, irrespective of one's experience and excellence in research, to become thesis supervisor requires obtaining the accreditation to supervise research (HDR, "*habilitation à diriger des recherches*"), based on a peer review process. These mechanisms do not facilitate researchers' mobility to French positions.

Researchers from outside the EU can benefit from "scientific visas" and "residence permits for scientists". These specific procedures are simplified to facilitate scientists' access to researchers' positions within the French research system. Since the entry into force of the Law of 16 June 2011 on immigration, scientists have access to the "long stay visa" as an equivalent to "residence permit". With long stay visas, administrative procedures are thus facilitated if their stay does not exceed one year.

The code for entry, residence and asylum of foreigners (CESEDA) was amended following the adoption of the Law of 22 July 2013 on higher education and research. The student or foreign researcher can now obtain a temporary residence permit for a period of 12 months (formerly 6 months), after having successfully completed a training course leading to a degree equivalent to a Master. This allows him/her to complete his/her training by professional experience, without limitation to a single job or a single employer.

### 3.2.3 Access to and portability of grants

As part of the ANR 2014 action plan, a new mobility scheme may usefully be described here. Labelled "Visiting top scholars", the ANR wishes to attract top researchers from abroad, providing them with excellent hosting conditions. ANR proposes a 3 to 4-year

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<sup>48</sup> *Cf.* « Décret n°84-431 du 6 juin 1984 fixant les dispositions statutaires communes applicables aux enseignants-chercheurs et portant statut particulier du corps des professeurs des universités et du corps des maîtres de conférences  
<http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=LEGITEXT000006064492&dateTexte=20150102>

funding dedicated to top foreign scientists of any nationality; funded fellows shall settle in France for the duration of the funding and conduct a research project in a French research institution. The first call for proposals has led to the selection of 28 researchers, who were granted with a total of €14m. 190 proposals were submitted, 68% of which coming from European research institutions.

As far as ANR fellowships are concerned, portability is not an option: the agency shall support researchers to carry out research in France, and not elsewhere. Researchers living in another EU country may answer an ANR call for proposals but the selected project must lead in France. Access to cross-border grants ANR fellowships are open to non-residents, as are those of all French research organisations.

### **3.2.4 EURAXESS**

France is active through the French EURAXESS Service Centres (*cf.* Euraxess France Network<sup>49</sup>). The centres provide foreign researchers with hospitality and personalised assistance (daily life, education of children, housing search, learning French, and all aspects of cultural integration). There are thirty EURAXESS service centres (employing fifty people) throughout the country which ensure on a daily basis an effective assistance network. Since 2013, it has the legal structure of an Association and is formally coordinated by the Conference of the Presidents of Universities (CPU); its Board of Directors is composed of key players on mobility issues such as the “Cité internationale universitaire de Paris” or the ABG Intelli’Agence and of elected representatives of service centres. Four working groups aim at facilitating reception and mobility of researchers:

“Housing”. Development of a guide for foreign researchers detailing the French practices in housing

“Communication”. Development of tools to promote France EURAXESS network

“ALFRED”. Monitoring of the national database of foreign researchers established by FnAK-CIUP and based on voluntary registration

“Best practices and quality”. Establishment of a system for the identification and exchange of good practices within the French network

As a result, in 2010, the EURAXESS France network has assisted over 40,000 scientists from 130 countries.

In addition, most public teaching and research positions are now posted on the EURAXESS jobs portal. Researchers and teaching positions proposed by French universities are published on a specific national website<sup>50</sup> and automatically transmitted to EURAXESS jobs portal since 2010. Public and private research organisations also publish on EURAXESS jobs portal: CNRS since its 2015 recruitment campaign, CEA, INRA IFREMER, INRIA, IFP Energies nouvelles...

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<sup>49</sup> <http://www.euraxess.fr/en>

<sup>50</sup> [https://www.galaxie.enseignementsup-recherche.gouv.fr/ensup/emplois\\_publics.html](https://www.galaxie.enseignementsup-recherche.gouv.fr/ensup/emplois_publics.html)

### 3.2.5 Doctoral training

Most of the 300 doctoral schools responsible for the 62,000 doctoral students in France in 2013-2014<sup>51</sup> develop close links with all potential recruiters of PhDs, including companies that are employers of researchers, and provide high quality training and learning services to their young talents. Universities (and their components and groupings) are autonomous in developing doctoral training as long as they comply with the 2009 Decree<sup>52</sup>. The Decree notably provides the minimum doctoral student's wage and stipulates that access to appropriate training must be guaranteed. This legal document is generally complemented with a "charter", specific to each doctoral school, which details reciprocal rights and duties<sup>53</sup>.

Thanks also to the evaluations of doctoral schools carried out by the High Council for Evaluation of Research and Higher Education (HCERES, which replaced AERES), PhD programmes are becoming professional education and training institutions.

CIFRE (Conventions industrielles de formation par la recherche / Industrial Research Training Conventions) is a national-level scheme which addresses directly the innovative doctoral training principle. CIFRE aims at contributing to the competitiveness and innovation of French business. It encourages exchanges between public research laboratories and socioeconomic environments and contributes to helping doctors find employment in companies of all sizes. CIFREs have already succeeded in bringing together over 6,000 companies and 4,000 academic research laboratories, involving 12,000 PhDs.

Through CIFRE<sup>54</sup>, PhD trainees are recruited on either a permanent or a 3-year contract, with a minimum gross annual salary of €23,484. They study for their PhD while carrying out research work within the company and academic laboratory.

### 3.2.6 HR strategy for researchers incorporating the Charter and Code

The implementation of the HR strategy for researchers by French public research institutions and universities is coordinated by the Ministry for Primary, Secondary and Higher Education and Research with partners that include, among others, the CPU and the AMUE (Agence de mutualisation des universités et établissements). Most research organisations have adopted and incorporated the principles of Charter and Code in their HR policies. Universities are in the process of doing so. National coordination mission should inform and accompany them in their approach of obtaining the European "HR Excellence in research" label. To date, only one public research organisation –INRA– and one university – Montpellier, as of March 2015– obtained the label. Others are enrolled in the process.

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<sup>51</sup> [http://cache.media.education.gouv.fr/file/2014/04/7/DEPP\\_RERS\\_2014\\_344047.pdf](http://cache.media.education.gouv.fr/file/2014/04/7/DEPP_RERS_2014_344047.pdf)

<sup>52</sup> [www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000020552499&dateTexte=20150101](http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000020552499&dateTexte=20150101)

<sup>53</sup> As illustrated by,

<http://www.agroparistech.fr/abies/images/stories/telechargement/charteagroparistech2010.pdf>

<sup>54</sup> Cf. [http://www.anrt.asso.fr/fr/pdf/plaquette\\_cifre\\_complete\\_avril2009\\_GB.pdf](http://www.anrt.asso.fr/fr/pdf/plaquette_cifre_complete_avril2009_GB.pdf)



### 3.2.7 Education and training systems

The French higher education and training systems are attractive. From 2000 to 2012, the overall student population growth rate was slightly above 10%, while the foreign students' grew up to 66%. One in eight students in French higher education are foreigners (i.e. 289,274 students, in 2012-2013). Foreign students have contributed to more than a third (38%) of the enrolment growth. The higher the degree, the higher the proportion of foreign students: from 11% of the students in License, to 18% in Master, and to 41% at doctorate level. France is in the top five most attractive countries in the world in terms of students, roughly at the level of Germany and Australia, though far behind the United States and the United Kingdom.

A major line of action over the last four years was the promotion of excellence in education, notably through the Investments for the Future Programme (PIA). As of 2011, the Excellence Initiatives (Idex) allowed to develop eight world-class multi-disciplinary centres of excellence in higher education and research (for an investment of for an amount of about €7b over ten years): Idex Paris-Saclay, Idex Bordeaux, Paris Sciences et Lettres, Université Sorbonne Paris Cité, Sorbonne Université, Université de Toulouse and Université de Strasbourg. A new call for Idex projects was launched in November 2014 (closing date in January 2015) by the National Research Agency<sup>55</sup>. Idex were accompanied by the creation of Excellence Laboratories (Labex) and Excellence Equipments (Equipex), for an investment of €2b over ten years to provide the best French research laboratories with improved resources and invest in the latest equipment to enable them to compete internationally. Excellence Initiatives are complemented with the Technological Research Institutes (IRT), which bring together the skills of the industrial sector and public research through public-private co-investment and cooperation between all those involved. Part of their mission consists in developing joint excellent education programmes. As an example of that, one of the main objectives of the Paris-Saclay Institute Energy Efficiency (PS2E)<sup>56</sup> is to enrich the human capital by providing educational qualification that enables to meet current energy challenges, and thus enables energy companies to learn new skills on existing and emerging professions.

A special attention is paid to address the innovation skills gap, as illustrated by the launch of the call for projects "Culture of Innovation and Entrepreneurship"<sup>57</sup> on 23 December 2014, by the Minister for Primary, Secondary and Higher Education and Research. In line with previous recent efforts, it will mobilise the National Innovation Fund of the Investments for the Future Programme, as a part of the government "A new deal for innovation" plan. The €20m call for projects (20 successful projects are expected) is designed to promote and expand existing initiatives that have demonstrated their effectiveness. The proposals should demonstrate their ability to develop the spirit of enterprise and innovation, or the acquisition of computer programming skills by young people (college or university degree). Proposals aiming at teaching computer code for school children in the first degree in the framework of extracurricular activities will be particularly welcome. Partnerships between formal education and other sectors are therefore also promoted.

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<sup>55</sup> [http://www.gouvernement.fr/sites/default/files/contenu/piece-jointe/2014/11/aap\\_idex\\_i-site\\_pia\\_2.pdf](http://www.gouvernement.fr/sites/default/files/contenu/piece-jointe/2014/11/aap_idex_i-site_pia_2.pdf)

<sup>56</sup> <http://institut-ps2e.com/formation/presentation/>

<sup>57</sup> [http://www.gouvernement.fr/sites/default/files/contenu/piece-jointe/2014/12/cp\\_aap\\_fni\\_entrep.pdf](http://www.gouvernement.fr/sites/default/files/contenu/piece-jointe/2014/12/cp_aap_fni_entrep.pdf)

In addition to existing initiatives, from 1 December 2014 to the end of February 2017, a permanent call for projects labelled “Partnerships for vocational training and employment” is opened<sup>58</sup>. Endowed with €126m, the programme will boost the development of local solutions based on a joint commitment between economic actors and training and education institutions. Selected projects shall contribute to develop synergies between educational activities and human resources management. Through the solutions proposed, companies shall be able to better anticipate skills-related economic evolutions and workers shall improve their ability to drive their professional development.

A number of on-going efforts are designed to simplify the education landscape (e.g. reduction of the number of Masters’ denominations), to adopt the highest quality standards, including at doctoral level, to facilitate university-enterprise relationships, to develop and implement innovative methods including MOOC. According to the new Law on Higher Education and Research, to quote but a few measures aimed to simplify the education framework: accreditation of HEIs for the duration of the multi-year contract with the central government during which they must comply with a “national training framework”; digitalisation of the education system, giving priority to the use of FOSS, HEIs shall also make available, where possible, their education in digital forms, each COMUE shall appoint a VP dedicated to digital issues and resources.

### ***3.3 ERA priority 5: Optimal circulation and access to scientific knowledge***

#### **3.3.1 e-Infrastructures and researchers’ electronic identity**

The Law on Higher Education and Research of 22 July 2013 provides higher education training services with digital resources and training to use them. As an implementation mode, the Ministry for Primary, Secondary and Higher Education and Research launched “France Université Numérique” (FUN), a MOOC (Massive Open Online Courses) platform. Since October 2013, those HEIs that wish to provide their students with training in French and open online educational resources can benefit from FUN<sup>59</sup> services (part of France Europe 2020).

By bringing together French universities and schools on this project, it is intended to give international visibility and provide all publics with access to various courses and quality anywhere in the world. FUN courses are designed by university professors and their international academic partners. Under the coordination of the Ministry for Higher Education and Research, technical inputs come from: INRIA for the deployment of the platform, CINES for the design, administration and hosting IT infrastructure, and RENATER for infrastructure networks. As for the content and functionalities, experts and representatives of the teaching staff of the university community participated.

FUN includes a 18-action strategic agenda, which aims to make of digital platforms a lever to accompany the students at each stage of their career: orientation, training, professional

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<sup>58</sup>[http://www.gouvernement.fr/sites/default/files/contenu/piece-jointe/2014/11/aap\\_partenariats\\_pour\\_la\\_formation\\_professionnelle.pdf](http://www.gouvernement.fr/sites/default/files/contenu/piece-jointe/2014/11/aap_partenariats_pour_la_formation_professionnelle.pdf)

<sup>59</sup> <https://www.france-universite-numerique-mooc.fr/>

integration and regular update of their knowledge and skills in a rapidly evolving environment. One may emphasise Action #7, which aims at a better acknowledgement of university teachers and researchers' investment to integrate digital technology into their teaching practices. This is to be accompanied by process through which the teaching part of the academic job has a stronger impact on the career path.

At all levels, from Ministry to universities (and COMUE), from PRO level to public librarians of national schools, actions are being implemented in order to establish and disseminate among researchers a clear policy when it comes to researchers' electronic identity.

### **3.3.2. Open Access to publications and data<sup>60</sup>**

In January 2013, the Minister for Higher Education and Research at the fifth "Days of Open Access" stated that "*scientific information is a public good that should be available for all*". As a consequence, the French Government wishes to develop green and gold access in a balanced and complementary way, while assisting the users that prefer gold access during the negotiation of licences with publishers. A hybrid system between green and gold accesses is also promoted, aimed at developing an open access to publishing that allows authors and readers to access scientific publication without payment.

France is rather active in the field of open access, with hundreds of French open access journals, tens of open disciplinary warehouses and institutional archives, and a handful of platforms. Nonetheless, the latest "Open access in France: state of the art" dates back to 2010, and the August 2013 ScienceMetrix report entitled "Proportion of Open Access Peer-Reviewed Papers at the European and World Levels – 2004-2011": France is still below 50% of open access articles, i.e. circa 46%, including 40% of green and hybrid. New policy efforts were therefore deemed necessary. Recent noteworthy high-level initiatives include:

the creation of the Secretariat-General for Government Modernisation (SGMAP) (Decree of 30 October 2012) under direct authority of the Prime Minister; it reports to the Minister of State, with responsibility for State Reform, including Etalab in charge of administrative open data,

the launch of the "OpenData France Association" in October 2013, an association which represents and supports local communities in a process of opening up their public data.

The main publication repository is the HAL open archive platform (Online Hyper Articles Platform), which collects institutional archives. HAL is a national and disciplinary platform, interoperable with local and international thematic archives as PubMed Central or Arxiv. Nearly 3,000 documents per month are added. HAL hosts more than 80 archive collections of scientific institutions. ANR-funded projects have to be integrated in the HAL open archive platform. A partnership *via* a Memorandum of Understanding was created between research institutions, universities and "Grandes Ecoles" for the joint development and management of HAL.

In addition, the project "Bibliothèque scientifique numérique" (Digital Scientific Library) has been launched in 2009 as a federal national infrastructure to federate stakeholders in higher education and research. Its aim is to structure the field of scientific and technical

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<sup>60</sup> This section owes to the NCP's suggestions; parts of the texts are excerpts from: "Research Area Facts and Figures 2014: FRANCE", DG Research and Innovation, EC.

information on a national scale and to explore its different underlying challenges in ten fields of activities. A Steering Group representing all actors in the field of scientific and technical information was established to ensure coordination and issue recommendations. Two working groups are devoted to open access: publications and data.

A recently published report from the French Academy of Sciences, entitled “Les nouveaux enjeux de l’édition scientifique”<sup>61</sup> (i.e. emerging science publishing issues), acknowledges the importance of open access for the French research community, emphasising its economic dimension, and suggests a number of specific recommendations: “*the procedures followed to allow dissemination of scientific publications [shall be reorganised along two complementary lines; ‘Open Archives’ and ‘Institutional Open Access’. [These should be] financed by national agreements between public authorities and publishers, ensuring that academic standards for scientific quality are preserved.*” “*Efforts should be deployed to enlarge the framework of this approach to at least the European level*”, the Academicians added.

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<sup>61</sup> « Les nouveaux enjeux de l’édition scientifique », Académie des sciences, 27 octobre 2014 ; [http://www.academie-sciences.fr/presse/communiquerads\\_241014.pdf](http://www.academie-sciences.fr/presse/communiquerads_241014.pdf)

## **4. Innovation Union**

The French KT and innovation framework conditions are both stable and improving. They are by all accounts conducive to business investment in research and innovation. Many profound changes have indeed occurred over the last five years, and are still on-going, that favours science-based entrepreneurship, the development of knowledge markets, and knowledge transfer and open innovation, as the following paragraph illustrates. Major parts of the changes are implemented through funding allocated *via* the Investments for the Future Programmes or Bpifrance, the public investment bank dedicated to supporting businesses' investment in innovative projects.

### ***4.1 The knowledge transfer system***

#### **4.1.1 Actors**

At national level, two main government ministries share the responsibility for research and innovation policy; namely, the Ministry for Primary, Secondary and Higher Education and Research (MENESR) and the Ministry for the Economy, Industry and Digital Affairs (MEIN). In addition, under direct authority of the Prime Minister, the highly endowed High Commission for Investments (CGI) plays a pivotal role. Agencies such as the National Research Agency, Bpifrance, ADEME and many others which implement the MIREs, operate the government's KT and innovation policy. Regional and local authorities have their own budgets. They have been granted autonomy for deciding the amount they spend on R&D support.

#### **4.1.2 The KT and innovation policy**

The French KT and innovation policy is based on three founding documents:

The "KT Scheme" was published in November 2012; it defined the 15 principles on which the French KT policy would be based for the next years.

The "France Europe 2020" strategic agenda for research, technology transfer and innovation was published in May 2013. Knowledge transfer-oriented policies are presented in Chapter 5. It is entitled "Promoting innovation and technology transfer" (pp. 56-61) and addresses the challenge of the "efficiency of technology and knowledge transfer to industry". Principles defined in these documents have been translated in the new Law on Higher Education and Research, promulgated on 22 July 2013, which formulated a new national strategy for research. The on-going reform modifies key components of the system's organisation and deals with open innovation, technology and knowledge transfers, as shown in the new book of the Code of Research<sup>62</sup>.

The "Innovation Scheme" was published in November 2013. It defined 40 actions in favour of innovation in France.

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<sup>62</sup> <http://www.legifrance.com/affichCode.do?cidTexte=LEGITEXT000006071190>

The French KT and innovation policy aims at:

Developing synergetic relationships between research and innovation stakeholders;

Strengthening transfer of public research results, in particular to SMEs or through the creation of start-ups;

Developing the entrepreneurship and innovation culture;

Helping the companies' growth, in particular by innovation.

## **4.2 Science-based entrepreneurship**

Better valuation from public research performers, among which are primarily university research labs, synergising with enterprises, is the key purpose of the creation of SATTs (Technology Transfer Accelerating Compagnies) and IRTs (Technological Research Institutes), with their thematic variant ITEs (Energy Transition Institutes). These initiatives, stemming from the Investments for the Future Programme, should eventually represent a total public support of about €4 billion over ten years (€0.9b go to SATTs, €2b to IRTs and €1b to ITEs), leveraging equal private companies' investments. There are 14 SATT to fully cover the country in terms of the universities valorisation/commercialisation of research results in society. These private companies with public capital have the exclusive power to commercialise university research property rights. They are multi-thematic by nature. In any instance, they are expected to reach financial balance within ten years, mainly through the management of intellectual property rights from public research results<sup>63</sup>. A number of start-ups based upon the exploitation of matured academic research results are to be developed (the objective was 83 over the first three years of functioning). So far, about a small dozen are announced.

There are 8 IRTs (and 12 ITEs), which are thematic public-private partnerships, grouped in common technical research platforms. They shall reach financial balance through the provision of high TRL<sup>64</sup> research outputs. IP issues are to be properly dealt with in the consortium agreements. The following table illustrates key features of the IRTs:

**Table 8. Technological Research Institutes: location, content and members**

Name	Location	Technological research theme	Members
IRT Nanoelectronics	Grenoble	Nano-electronics	Minalogic, ST Microelectronics, Soitec, etc.
IRT AESE	Toulouse	Aeronautics , space and embedded systems	Aerospace Valley cluster, Airbus, Safran, Latécoère, etc.
IRT BIOASTER	Lyon and Paris	Infectious diseases	Lyonbiopôle, Biomerieux,

<sup>63</sup> It should be noted that, in the framework of Horizon 2020, their role and nature have to be described in the consortium agreements and declared to project partners.

<sup>64</sup> Technology readiness levels.

			Sanofi, Danone, Institut Pasteur pole, etc.
IRT M2P	Metz, Belfort - Montbéliard, Troyes	Materials, metallurgy and processes	Matériaux, Vehicle of the Future, Microtechnology, Fibre, Saint-Gobain, Arcelor-Mittal, etc.
IRT Railenium	Valenciennes, Villeneuve d'Ascq	Railway infrastructures	I-Trans, RFF, Alstom, SNCF, etc.
IRT Jules Verne	Nantes	Composite materials	EMC2, Airbus, STX, DCNS, Alstom, Segula pole, etc.
SystemX	Saclay	Digital Engineering Systems	Alstom, Alcatel-Lucent, Bull, Distene, Systematic, Esterelle Technologies, INRIA, Institut Mines Telecom, OVH, Renault, etc.
IRT B-COM	Rennes	Digital networks and infrastructure (pole Images and networks)	Orange, TDF, Thomson Video Networks, INRIA, INSA de Rennes, Supélec, Telecom Bretagne, etc.

**Sources:** Compiled from the institutions' Internet websites.

### **4.3 Knowledge markets**

A French patent box regime was introduced in 2000 (and amended in 2005 and 2010). Qualifying IP income and capital gains from qualifying IP are taxed at a reduced 15% rate of corporate tax, compared with the standard rate of 33.33%.

The R&D tax credit framework includes specific provisions with respect to patent-related expenses which are in many ways eligible expenses:

the cost of applying to and maintaining patents and Proprietary Variety Certificate,

the costs of defending patents and Proprietary Variety Certificate,

the amortisation of acquired patents for research and Proprietary Variety Certificate,

premiums and contributions or share of premiums and contributions in respect of the legal expenses insurance contracts for the management of expenditure incurred in litigation relating to a patent or a plant variety certificate whose company is holder are included in the limit of €60,000.

Secondly, INPI (Institut national de la propriété industrielle), the French patent office is entirely self-funded and actively participates in the development and implementation of public policies in the field of industrial property and anti-counterfeiting. INPI is in the decision loop regarding recent initiatives from the Commissariat général à l'investissement (CGI, the governing body responsible for the management of the Investments for the Future Programme) and from the Ministry for the Economy, Industry and Digital Affairs (MEIN). All over the country thanks to its regional offices, INPI has been very active in recent years in supporting, informing, educating and providing training to innovators. It has developed coaching solutions for SMEs to get their organisations IP-active so that they can fully benefit from their knowledge creation processes; the latter may then be re-designed.

This goes as far as providing support for export initiatives, thanks to a large international network of country correspondents. On the international side, INPI adapts and builds industrial property rights, with a strong implication in European and global forums.

Thirdly, recent changes in the French systems are guided by a new attention to creativity and intellectual property value. Most Investments for the Future Programmes (PIA) funded projects have effects in terms of IP creation, valuation and protection. This is so of France Brevets. Established in March 2010, this experimental sovereign patents fund would eventually benefit from €100m capital, half from Caisse des dépôts et consignations (CDC), half from the PIA. The Fund's mission is to support private and public research to better leverage its patent portfolio on the international stage. So far, its investment priority area is ICTs. This aspect is meant to be complemented with aeronautics and space, new energy, chemistry, materials, life and environment sciences.

## ***4.4 Knowledge transfer and open innovation***

### **4.4.1. General structure of the current KT system**

One of the current objectives of recent research and innovation policies in France is to better link public and corporate research to reach a higher competitiveness level. A specific focus is also placed on improving the support for the exploitation of research outcomes from a business perspective. The new Law on Higher Education and Research, promulgated on 22 July 2013, includes the formulation of a new national strategy for research, incorporated into France Europe 2020 strategic agenda for research, technology transfer and innovation.

The on-going reform modifies key components of the system's organisation and deals with open innovation, technology and knowledge transfers, as exemplified in the new book of the Code of Research<sup>65</sup>. The law notably stipulates that inventions resulting from publicly funded research should preferably be commercialised through SMEs and ETIs on European territory.

Noteworthy changes were implemented in the framework of the law, including: first, a single representative shall be given the responsibility for the management, operation and trading of patentable inventions made by State personnel and persons vested with public research mission, when the whole or part of the property is shared among several public research institutions<sup>66</sup>. Second, as mentioned above, the transfer of research results to the service of society is added to the mission of higher education and public research.

The mainstreaming of the knowledge transfer mission through the law stems from converging societal and political evolutions. Within a few months after the nomination by President Hollande of the first Minister for Higher Education and Research a founding policy document was issued: "15 measures for a new transfer of public research dynamics,

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<sup>65</sup> <http://www.legifrance.com/affichCode.do?cidTexte=LEGITEXT000006071190>

<sup>66</sup> Décret n° 2014-1518 du 16 décembre 2014 relatif au mode de désignation et aux missions du mandataire prévu à l'article L. 533-1 du code de la recherche



a lever for growth and competitiveness<sup>67</sup>". It was published in the form of a joint communication of the Ministry for Research and the Ministry for the Economy at the close of the Council of Ministers of 7 November 2012. It was then included in the France Europe 2020 strategic agenda (May 2013). In the meantime, the Beylat-Tambourin report was issued.

Knowledge transfer-oriented policies are listed in "France Europe 2020"<sup>68</sup> strategic agenda (May 2013), and especially in Chapter 5 entitled "Promoting innovation and technology transfer" (pp. 56-61), which addresses the challenge of the "efficiency of technology and knowledge transfer to industry". In more detail, the Strategic Agenda specifies 6 main lines of action:

- Piloting, supporting and monitoring the stakeholders involved in knowledge transfer
- Dissemination of transfer and innovation culture within public research
- Improved management of intellectual property publicly funded research
- Strengthening transfer to SMEs
- Strengthening of transfer by the creating companies
- Research on transfer and entrepreneurship (via the creation of a think-tank)

#### **4.4.2. Taking stock of the PIA actions related to KT**

Investments for the Future Programmes (PIAs) are very much solicited in order to ensure that public research contributes to open innovation and foster knowledge transfer between public and private sectors through national knowledge transfer strategies. Key initiatives consist in funding:

– SATT (Sociétés d'accélération du transfert de technologies), Technology Transfer Accelerating Companies. There are 14 private companies with full public capital so far, geographically distributed nationwide, benefiting from €0.9b over ten years. Evaluations shall help decide whether SATTs are to be continued or not. One interim evaluation was carried out on the five first SATTs; the results were delivered by end 2014. The results were deemed satisfactory enough so that they have benefited from a complementary funding of €104m. To be more specific, SATT Conectus received €18m, SATT Sud-Est, €22m, SATT Toulouse Tech Transfer, €24m, SATT Lutech, €18m, SATT Idf-innov, €22. They are mandated by public research institutions to take care of the value creation process from research results' intellectual property. According to the most recent budgetary documents<sup>69</sup>, the SATTs declared the following progress indicators (as of May 2014):

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<sup>67</sup> [http://cache.media.enseignementsup-recherche.gouv.fr/file/transfert/05/2/DP-15\\_mesures\\_pour\\_le\\_transfert\\_de\\_la\\_recherche\\_232052.pdf](http://cache.media.enseignementsup-recherche.gouv.fr/file/transfert/05/2/DP-15_mesures_pour_le_transfert_de_la_recherche_232052.pdf)

<sup>68</sup> [http://cache.media.enseignementsup-recherche.gouv.fr/file/France-Europe\\_2020/21/7/AgendaStrategique\\_252217.pdf](http://cache.media.enseignementsup-recherche.gouv.fr/file/France-Europe_2020/21/7/AgendaStrategique_252217.pdf)

<sup>69</sup> [http://www.performance-publique.budget.gouv.fr/sites/performance\\_publique/files/farandole/ressources/2015/pap/pdf/jaunes/jaune2015\\_investissements\\_avenir.pdf](http://www.performance-publique.budget.gouv.fr/sites/performance_publique/files/farandole/ressources/2015/pap/pdf/jaunes/jaune2015_investissements_avenir.pdf)

358 people specialised in intellectual property, technology projects management, law, marketing and business development are employed.

2,300 projects were detected and analysed.

372 priority patents were filed.

€48m were invested in “maturing projects”.

86 licenses were signed.

22 start-ups were created.

CVT (Consortiums de valorisation thématiques), thematic national coordination structures of SATT benefiting from €50m, over the same period.

IRT/ITE (Instituts de recherche technologique / Instituts pour la transition énergétique) form a continuum of technology research public-private platforms. There are 20 of those and they benefit from about €3b over ten years. Legally, they are set up as foundations. According to the most recent available budgetary documents<sup>60</sup>, voted budget for IRTs are €471m of “consumable endowments” and €1.5b of non-consumable endowment. As of 31 July, €166.2m were actually spent. Voted budget for ITEs are €221m of “consumable endowments” and €655m of non-consumable endowment. As of 31 July, €40m were actually spent. One only out of the 8 IRTs in operation has declared some progress or impact indicators. There are 12 ITEs in operation. So far, no progress or impact indicators are available.

On the whole, the latter projects are designed to develop sustainable public-private partnerships over a ten-year period. This substantial investment of €3b is designed to transform the French knowledge transfer landscape.

#### **4.4.3. Noteworthy other KT initiatives, KT indicators**

Other key initiatives include the 5 CEA-TECH platforms (a CEA own initiative), the Carnot 3.0, and the National Research Agency’s calls for proposals named “LabCom”, aiming at the creation of 100 SME-public research joint labs.

A number of indicators can be put forth in order to illustrate current state of KT and KT policy in the French R&I system, as indicated in the following three tables.

**Table 9. General Knowledge Transfer indicators**

KT INDICATORS	Proxies
# of start-ups (incl. Turnover and survival rate) stemming from public-private cooperation	<b>65</b> in 2012 in the framework of the Instituts Carnot; <b>22</b> in 2013, in the framework of the SATTs, according to budgetary documents <sup>60</sup>
Volume of “partnership” and joint collaborative research agendas signed between the public and private sectors	<b>€2b</b> (2011), i.e. 10% public of effort according to IGF (2013) <sup>70</sup>
Other public research commercialisation indicators (e.g.: Licensing fees, consultancy contracts, etc.)	<b>11</b> licensing programmes launched by France Brevets, according to budgetary documents <sup>71</sup> ; the objective is <b>18</b>
Information on technology transfer offices, university business incubators, science and technology parks, etc.	<b>14</b> SATTs; <b>8</b> IRTs, <b>12</b> ITEs; <b>5</b> CEA TECHS; <b>33</b> labelled Instituts Carnot; <b>100</b> Labcoms (National Research Agency’s target)

**Table 10. Staff mobility as KT indicators**

KT POLICY INDICATORS	Proxies
# of researchers in PRO with experience in the private sector	<b>1,500</b> Associate prof. (mostly teaching): (2011-2012)*
Share of doctorate holders employed in the business enterprises sector	<b>17,757</b> in R&D, i.e. 9% of the population of researchers in enterprises (2011); in 2012, <b>52%</b> of doctorate holders work in public R&D, <b>25%</b> in private R&D; private non-R&D: <b>13%</b> ; pub. non-R&D <b>10%</b>
Number of researchers benefiting from academia-industry research placement/exchange contracts	From the CIFRE system, + <b>1,200</b> , on average, per year over the last 30 years
Academia held patents licensed or sold to industry	<b>86</b> signed in 2014 by universities, according to SATT declarations

**Source:** Collected from relevant public official documentation (multiple sources). **NB**; \*: extrapolated from: [Note d'information 13.07 : Les personnels enseignants de l'enseignement supérieur sous tutelle du M.E.S.R. 2011-2012](#) ; Table 6 p. 6

<sup>70</sup>

[http://cache.media.enseignementsup-recherche.gouv.fr/file/2013/01/0/recherche\\_partenariale\\_rapport\\_254010.pdf](http://cache.media.enseignementsup-recherche.gouv.fr/file/2013/01/0/recherche_partenariale_rapport_254010.pdf)

<sup>71</sup> [http://www.performance-publique.budget.gouv.fr/sites/performance\\_publique/files/farandole/ressources/2015/pap/pdf/jaunes/jaune2015\\_investissements\\_avenir.pdf](http://www.performance-publique.budget.gouv.fr/sites/performance_publique/files/farandole/ressources/2015/pap/pdf/jaunes/jaune2015_investissements_avenir.pdf)

**Table 11. Patent applications by PROs as indicators of KT**

Rank	PROs	# of patent applications by PRO 2015
6	CEA (Commissariat à l'énergie atomique et aux énergies alternatives)	643
10	CNRS (Centre national de la recherche scientifique)	565
20	IFP Energies nouvelles	193
21	INSERM	165
32	Université Claude Bernard Lyon 1	58
33	Université Pierre et Marie Curie Paris 6	56
41	Université de Strasbourg	39
43	INRA (Institut national de la recherche agronomique)	37
50	CNES (Centre national d'études spatiales)	33
50	Université de Montpellier 2	33

**Source:** [Laurence Sekkat, Les palmarès de déposants de brevets, Statistiques INPI ; avril 2015](#)

#### **4.5 Innovation framework for SMEs**

All along this report, the list of policy measures dedicated to favour SMEs and Young Innovative Enterprises' development has but grown, filling up the whole continuum from support to start-up created out of researchers' inventions to specific innovation-oriented R&D tax credit (favouring demonstrators).

We have stressed the existence of policies and instruments such as innovation and knowledge clusters (competitiveness clusters / "*pôles de compétitivité*" for instance) and knowledge transfer platforms (Institutes of Technological Research, Institutes for Energy Transition, SATTs, Instituts Carnot, Labcoms). These measures encourage cooperation and knowledge sharing so that a more favourable business environment for SMEs is in place. As far as the framework is concerned, the creation of an Ombudsman (*médiateur interentreprises*) service dedicated to facilitating innovation relations between companies (SMEs and large in particular), seating with the "médiation interentreprises" service must be emphasised<sup>72</sup>.

Many financial products of Bpifrance are dedicated to innovation-driven SMEs. As put forth in Bpifrance's institutional brochure (p. 13): "*Bpifrance assists businesses of all sizes, primarily micro-businesses, SMEs, mid-caps. But we also assist big firms that are considered strategic in terms of national economy, the territories or employment*". There is a limited number of well-targeted, clearly differentiated, and easy to access support

<sup>72</sup> Officially launched on 13 March 2014, as a sequel to the "New deal for Innovation" (November 2013) plan; cf. [http://www.economie.gouv.fr/files/files/directions\\_services/mediation-interentreprises/COMMUNIQUE\\_DE\\_PRESSE\\_INNOVATION\\_DEF.pdf](http://www.economie.gouv.fr/files/files/directions_services/mediation-interentreprises/COMMUNIQUE_DE_PRESSE_INNOVATION_DEF.pdf)

schemes to finance innovation. The funding support is tailored to the needs of SMEs, while bureaucracy kept to a minimum. Bpifrance is one of the two French banking intermediaries<sup>73</sup> which are entitled to implement InnovFin (implemented by the European Investment Bank and the European Investment Fund). InnovFin SME offers up to 50% loan guarantee to support risky SME innovative projects. €450 will be injected through this mean in innovative SMEs<sup>74</sup>.

To add on all these well-known mechanisms, the MENESR has supported the Young Innovative Enterprises (JEI) scheme<sup>75</sup> since 2004 (at least until 2016). So far, the JEI scheme benefited to about 3,000 companies, for an amount of social security exemptions of €108m (according to ACOSS 2014, [www.acoss.fr](http://www.acoss.fr)), for total R&D expenditures of €700 m, mainly in the services.

It has to be noted that, despite efforts, such as those made in the context of the “Loi de modernisation de l’économie<sup>76</sup>” (Economy Modernisation Law, 2008), much remains to be done on insolvency regulations to support the financial reorganisation of enterprises. In the same line of reasoning, in spite of the Economy Modernisation Law which implied a vast harmonisation of practices, SMEs are still regularly confronted with customer payment delays (often beyond 60 days) and are ill equipped to cope.

## **4.6 Venture capital markets**

Improving access to finance for R&D and innovation is the purpose of **Bpifrance**, a new public investment bank created by law of 31 December 2012. In July 2013, Bpifrance received a total capital of €21b. Bpifrance is by far the biggest venture capitalist in France: in 2013 for instance 95% of the national venture capitalist activity was supported by Bpifrance, for about €500m. In November, the market power of Bpifrance augmented with the launch of a new fund, “Large Venture”, which aims to support innovative businesses in priority sectors of health, the digital and the environment, and for venture capital operations starting at €10m. To be more specific, Large Venture will mainly invest in innovative companies jointly with private partners, and may invest in listed and unlisted companies for long periods. The fund will complement existing direct equity funds such as “Innobio”, “Digital Ambition” and “Environmental technologies”, and invest also in funds of funds.

As described by Bpifrance, its most important support activities, basically financial products, are:

*Equity investment.* It aims at bringing a minority investor in public capital to sustain small companies’ business and boost its development.

*Contract participatory development.* It aims at helping SMEs and ETIs to build their own funds for development projects.

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<sup>73</sup> The other one is BPCE.

<sup>74</sup> Cf. [http://www.eif.org/what\\_we\\_do/guarantees/RSI/news/2013/bpifrance.htm](http://www.eif.org/what_we_do/guarantees/RSI/news/2013/bpifrance.htm)

<sup>75</sup> Cf. Decrees: <http://cache.media.enseignementsup-recherche.gouv.fr/file/00/7/7007.pdf> and <http://cache.media.enseignementsup-recherche.gouv.fr/file/01/3/7013.pdf>

<sup>76</sup> <http://legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000019283050&dateTexte=20150101>

*Pre-financing of the R&D tax credit (CIR).* For innovative SMEs to have immediate cash to cover R&D expenses for current fiscal year, an interest rate being applied.

Pre-financing of CICE (Tax credit for competitiveness and employment). Same system as with R&D tax credit, immediate cash-in.

*Guaranteed cash loans.* This is the second measure of the National Pact for Growth, Competitiveness and Employment: Bpifrance provides guarantees to any bank that lends to medium term (2-7 years) to their SME clients to alleviate their short-term debt.

*Innovation loan.* Aiming at helping SMEs finance their industrial and commercial development in France or abroad, even in the absence of collaterals.

Bpifrance export loan.

Even though there are other measures, Bpifrance is a major change: it is a unique centralised entry point to finance for innovative SMEs. It covers all their development needs, from “*caprisk*” to “*capdev*”. As described in the bank documentation, there is a limited number of well-targeted, clearly differentiated, and easy to access support schemes. The funding support is tailored to meet SMEs needs. Selection criteria are straightforward.

## **4.7 Innovative public procurement**

The key initiative is “Measure 32” of the National Pact for Growth, Competitiveness and Employment<sup>77</sup>. It encourages innovative public procurement. Through this measure, public procurement dedicated to SMEs shall reach 2% of public procurement in 2020, including purchases of government hospitals for roughly €40b, half of which on local authorities. As of 30 January 2014, “the Handbook of innovative public procurement” was published. Resulting from a consultation process carried out from April 2013 to January 2014, the “Handbook” provides a picture of good and bad practices in innovative public procurement in the form of “15 key success factors”. In addition to this explanatory publication, a number of actions were implemented:

The Government Procurement Department publishes the Ministries and Public institutions’ roadmaps of innovative public procurement.

An on-line platform of innovative public procurement was launched to facilitate the connection between innovative SMEs and the ministries and public institutions<sup>78</sup>.

Last but not least, a new provision labelled “Innovation Partnership” was added to the Code of Public Markets, as part of the decree on simplification measures for public procurement, and entered in force on 1 October 2014<sup>79</sup>. The Innovation Partnership aims to overcome the structural hurdles of current research and development contracts that impose to open a new competition at the end of the R&D phase to be able to acquire the resulting innovative products or services. The Innovation Partnership thus allows public procurers to

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<sup>77</sup> <http://www.invest-in-france.org/Medias/Publications/1888/France-National-Pact-for-Growth-Competitiveness-and-Employment-JAN-2013.pdf>

<sup>78</sup> <http://www.achatspublics-innovation.fr/>

<sup>79</sup> <http://www.legifrance.gouv.fr/eli/decret/2014/9/26/EINM1412633D/jo/texte>

develop a structured long-term partnership covering both R&D and procurement of innovative products and services, without the need for a new production competition.

## 5. Performance of the National Research and Innovation System

This chapter aims to assess the performance of the national research and innovation system. It identifies the structural challenges it faces and considers possible solutions.

### 5.1 Performance of the National Research and Innovation system

As shown in the table below, France's research and innovation policy is evolving so as to maximise the effectiveness of its long-standing scientific strengths. Many input indicators are positively oriented thanks to dedicated policy actions which so far do not fully translate into output indicators. Hence the evolution of policies aiming at favouring this translation process: better promotion of research careers, better career opportunities for doctorate holders (especially in private companies), which are the first steps towards better links between public research and industry, new funding and evaluation agencies and mechanisms, competitiveness clusters, autonomy of universities (including the recent COMUEs), stable R&D tax credit (CIR), Investments for the Future Programmes (1 and 2) and the strengthening of public-private cooperation and the valorisation of research results.

**Table 12. Assessment of the Performance of the national research and innovation system**

1. ENABLERS	Year	FR	EU
<b>Human resources</b>			
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	2011	--	1.70
Percentage population aged 30-34 having completed tertiary education	2012	43.60	35.80
<b>Open, excellent and attractive research systems</b>			
International scientific co-publications per million population	2012	706.94	343.15
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	2009	10.41	10.95
<b>Finance and support</b>			
R&D expenditure in the public sector as % of GDP	2012	0.78	0.75
Venture capital as % of GDP	2012	0.09	0.08
<b>2. FIRM ACTIVITIES</b>			
R&D expenditure in the business sector as % of GDP	2012	1.45	1.31



<b>Linkages and entrepreneurship</b>			
Public-private co-publications per million population	2011	49.01	52.84
<b>Intellectual assets</b>			
PCT patent applications per billion GDP (in PPSE)	2010	4.19	3.92
PCT patent applications in societal challenges per billion GDP (in PPSE) (climate change mitigation; health) <sup>80</sup>	2010	0.82	0.85
<b>3. OUTPUTS</b>			
<b>Economic effects</b>			
Contribution of medium and high-tech product exports to trade balance	2012	5.23	1.27
Knowledge-intensive services exports as % total service exports	2011	33.66	45.26
License and patent revenues from abroad as % of GDP	2012	0.49	0.59

Source: European Commission, IUS Database (2014).

## ***5.2 Structural challenges of the national R&I system***

According to IU scoreboard 2014, France is within the group of “Innovation followers” in terms of innovation performance<sup>81</sup>. Member States of this group show a performance above or close to the EU28 average. This mediocre ranking has not changed at least since EU Innovation scoreboard 2007.

Other recurrent rankings accounting for innovation inputs to monitor global economic/innovation performance draw an even darker picture: the country performance can be described as declining. France’s decline in terms of performance of innovation is reported in Insead Global Innovation Index, in The World Economic Forum’s Global Competitiveness Report, or in other specific reports with a multi-factorial approach (*cf.* e.g. the UNCTAD World Investment report).

As a consequence, over the latest years, there has been a profound renewal of the research and innovation policies. Still, much remains to be done and it would be justified to intensify efforts. Two noticeable changes have occurred in policymakers’ mind in the last two to three years in terms of the approach to this problem.

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<sup>80</sup> NB: While statistics on applications to national patent office are not always comparable across countries, they can provide some indication of technological development activities that are not captured by EPO/PCT data. In France, approximately 82 thousand patent applications were made at the EPO in the period 2000-2010. Approximately 67 thousand patent applicants took the PCT route. INPI (National Patent Office) received about 132 thousand applications in this period (these three figures are based on fractional counting).

<sup>81</sup> Together with Austria, Belgium, Cyprus, Estonia, Ireland, Luxembourg, Netherlands, Slovenia and the UK. *Cf.* [http://ec.europa.eu/enterprise/policies/innovation/files/ius/ius-2014\\_en.pdf](http://ec.europa.eu/enterprise/policies/innovation/files/ius/ius-2014_en.pdf), p.4.

In government circles, it has become common knowledge that the whole system is responsible: there is not one single detectable cause. As indicated above, the report “L’innovation, un enjeu majeur pour la France<sup>82</sup>” of April 2013 examined the key issues of the research and innovation with a systemic approach. As a result, systemic policy measures are required, some of which are listed in the report. The second significant change is the practical recognition of competitiveness as a vital economic objective, as stated in the National Pact for Growth, Competitiveness and Employment. The connection with the innovation and research system is explicitly made, as is visible in the France Europe 2020 strategic agenda (May 2013):

1. Mobilising research stakeholders on major societal challenges
2. Remodelling coordination and direction of research in France
3. Promoting technological research
4. Developing training and digital infrastructure
5. Promoting innovation and technology transfer
6. Internalising scientific culture
7. Programming research and innovation according to national strategic priorities
8. Building coherences around research and innovation sites
9. Increasing the presence of French research at European and international levels

Each of these nine action lines corresponds to a partial answer to some of the most important challenges of the French research and innovation system. France Europe 2020 (May 2013) details a set of associated measures. Convergent recommendations were made by the “Innovation, a major challenge for France” (April 2013) report and, earlier on, by the Ministry for Higher Education and Research in November 2012<sup>83</sup>. In a condensed manner, we identify four structural challenges:

Insufficient culture of innovation

Unsatisfactory relationships between the education system and the business and industrial world

Lack of efficiency of technology and knowledge transfer to industry

Limited use of evaluation and assessment tools to monitor socioeconomic impacts of research and innovation policies

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<sup>82</sup> Which was submitted to three Ministers, given the crosscutting nature of the topic: the Minister for “Higher Education and Research”, to the Minister for “Productive recovery” and to the Minister ‘Responsible for SMEs, Innovation and the digital Economy’.

<sup>83</sup> Entitled “15 measures for a new transfer of public research dynamics, lever for growth and competitiveness”, presented at the Council of Ministers of 7 November 2012. Nota: The measures are taken on board as such in France Europe 2020.

### 5.3 Meeting structural challenges

A number of structural challenges have been identified in the French system. The table below lists a selected number of actions and assesses appropriateness, efficiency and effectiveness of the actions. Since the changes aimed at are systemic, only convergent efforts over a rather long period of time can succeed.

**Table 13. Structural challenges and potential policy answers**

Challenges	Policy measures/actions addressing the challenge <sup>84</sup>	Assessment in terms of appropriateness, efficiency and effectiveness
1. A culture of innovation.	<p>&gt; Levers to trigger <b>cultural changes to improve a country innovation's abilities</b> include collective actions, supported, such as:</p> <ul style="list-style-type: none"> <li>. The development of associations dedicated to entrepreneurs "rebound", such as those gathered under the umbrella of the web portal "portail du rebond des entrepreneurs", portaildurebond.com</li> <li>. Organisation of conferences, supported by public policy and HEI such as: "bouncing entrepreneurs", 13 January 2014, supported by the Ministry for the Economy, Industry and Digital Affairs.</li> <li>. Links with challenge #2.</li> </ul>	<p>High level of appropriateness</p> <p>Both effectiveness and efficiency will be hard to assess (incl. regarding simple questions like: who, when and how much)</p>
2. Closer connections between the education system and the business and industrial world.	<p>&gt; <b>Sensitising</b> pupils and students all along the educational path to enterprises' functioning and business life and entrepreneurship</p> <ul style="list-style-type: none"> <li>. Cf. first two recommendations of "Innovation, a major challenge for France" (November 2012):</li> <li>1. Revise teaching methods in primary and secondary education to develop innovative initiatives.</li> <li>2. Establish a large-scale program for entrepreneurship learning in higher education.</li> </ul>	<p>High level of appropriateness</p> <p>Much remains to be done before any evaluation of the effectiveness and efficiency</p>
3. Better science-industry links: efficiency of technology and knowledge transfers to industry.	<p>&gt; Implementing <b>open innovation</b> measures:</p> <ul style="list-style-type: none"> <li>. "15 measures for a new transfer of public research dynamics, lever for growth and competitiveness" (November 2012; and in the chapter of the France Europe 2020 strategic agenda, May 2013).</li> <li>. IRT (Instituts de recherche technologique, with their thematic variant "Instituts pour la transition énergétique", ITE), public-private technological research labs (IRT+ITE~20).</li> </ul>	<p>High level of appropriateness.</p> <p>According to the High Commission for Investments, apparently rather good effectiveness; too early to assess</p>

<sup>84</sup> Changes in the legislation and other initiatives not necessarily related with funding are also included.

	<ul style="list-style-type: none"> <li>. SATT (Sociétés d'accélération du transfert de technologies), national coverage to commercialise research results to companies (SATT~10).</li> <li>. CEA-Tech, network of 5 local units, aiming at bringing the best key enabling technology from CEA research centres (LETI, LIST, LITEN) to SMEs in five regions.</li> </ul>	<p>efficiency</p> <p>In any instance: lack of transparency (cf. Challenge #4)</p>
4. Use of evaluation of research and innovation policy.	<p>&gt; Implementing consistent, independent and cross-ministerial evaluations and monitoring of innovation and research policies: a whole new evaluation scheme including:</p> <ul style="list-style-type: none"> <li>. The “Evaluation of Innovation Policies Committee” implemented under the auspices of France Stratégie (as of June 2014) whose mission is to assess the French innovation policies as a whole and in its parts, both on the basis of available reports and overseeing new studies; all reports will be made public.</li> <li>. The new High Council of the Evaluation of Research (established 1 November 2013).</li> <li>. Strategic Research Council (installed on 19 December 2013).</li> <li>. Growing number of published R&amp;I evaluations (notably by the Court of Auditors benefit from a large public attention).</li> </ul>	<p>High level of appropriateness.</p> <p>Both effectiveness and efficiency are globally improving; too early as regards this new initiative</p>

**Source:** Synthesis based upon the author's opinion.

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## Annex 2 - Abbreviations

ADEME Agence de l'environnement et de la maîtrise de l'énergie / Agency for Environment and Energy Management

AERES Agence d'évaluation de la recherche et de l'enseignement supérieur / Evaluation Agency for Research and Higher Education (former name of the HCERES)

ANR Agence nationale de la recherche / National Research Agency

AREVA Public industrial conglomerate specialised in energy, especially nuclear power

ASRC Association des structures de recherche sous contrats / Contract Research Organisations Association

BERD Business Expenditures for Research and Development

CEA Commissariat à l'énergie atomique et aux énergies alternatives / Alternative Energies and Atomic Energy Commission

CERN European Organisation for Nuclear Research

CGI Commissariat général à l'investissement / High Commission for Investments

CGSP Commissariat général à la stratégie et à la prospective / General Commission for Strategy and Economic Foresight (former name of France Strategy)

CICE Crédit d'impôt pour la compétitivité et l'emploi / Tax credit for competitiveness and employment

CIFRE Conventions industrielles de formation par la recherche / Industrial Research Training Conventions

CINES Centre informatique national de l'enseignement supérieur / National IT Centre for the Higher Education Sector

CIR Crédit d'impôt recherche / R&D tax credit

CNRS Centre national de la recherche scientifique / National Centre for Scientific Research

CNU Conseil national des universités / National University Committee

COMUE Communautés d'universités et d'établissements / University and Institution groupings

COST European Cooperation in Science and Technology

CPER Contrat de projet Etat-Région / State-Region Projects Contract

CSR Conseil stratégique de la recherche / Strategic Research Council

DATAR Délégation interministérielle à l'aménagement du territoire et à l'attractivité régionale / Interministerial Delegation for Territorial Development and Regional Attractiveness (now part of the Commissariat général à l'égalité des territoires - CGET)

DGRI Direction générale de la recherche et de l'innovation (MESR) / Directorate- General for Research and Innovation

EQUIPEX Excellence Equipments

ENA Ecole nationale d'administration

ERA European Research Area

ERA-NET European Research Area Network

ERDF European Regional Development Fund

ERP Fund European Recovery Programme Fund

ESA European Space Agency

ESFRI European Strategy Forum on Research Infrastructures

ETI Entreprise de taille intermédiaire / Mid-tier enterprise



EU	European Union
EU-27	European Union including 27 Member States
EU-28	European Union including 28 Member States
FDI	Foreign Direct Investments
FP	Framework Programme
FPRTD	Framework Programme for Research and Technological Development
FP7	7th Framework Programme
FUI	Fonds unique interministériel / Single Interministerial Fund (dedicated to competitiveness clusters)
FUN	France Université Numérique / France Digital University
GBAORD	Government Budget Appropriations or Outlays for R&D
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
HCERES	Haut Conseil de l'évaluation de la recherche et de l'enseignement supérieur / High Council for Evaluation of Research and Higher Education
HDR	Habilitation à diriger des recherches / Accreditation to supervise research
HEI	Higher Education Institution
HERD	Higher Education Expenditure on R&D
HES	Higher Education Sector
ICT	Information and communication technologies
IDEX	Initiative d'excellence / Excellence Initiative
IGF	Inspection générale des finances / Inspectorate-General of Finances
IHU	Instituts hospitalo-universitaires / University Hospital Institute
INED	Institut national des études démographiques / National Institute for Demographic Studies
INRA	Institut national de la recherche agronomique / National Institute for Agricultural Research
INSERM	Institut national de la santé et de la recherche médicale / National Institute for Medical Research and Health
IP	Intellectual Property
IRSTEA	Institut national de recherche en sciences et technologies pour l'environnement et l'agriculture / National Research Institute for Environment and Agricultural Sciences and Technologies
IRT	Institut de recherche technologique / Technology Research Institute
ITE	Institut pour la transition énergétique / Energy Transition Institute
JEI	Jeune entreprise innovante / Young Innovative Enterprise
JPI	Joint Programming Initiative
JTI	Joint Technology Initiative
KT	Knowledge Transfer
LABEX	Laboratoire d'excellence / Excellence Laboratory
MEDDE	Ministère de l'Ecologie, du Développement durable et de l'Energie / Ministry for Ecology, Sustainable Development and Energy
MEIN	Ministère de l'Economie, de l'Industrie et du Numérique / Ministry for the Economy, Industry and Digital Affairs

MENESR Ministry for Primary, Secondary and Higher Education and Research

MIRES Mission interministérielle recherche et enseignement supérieur / Interministerial Mission on Research and Higher Education

MRP Ministère du Redressement productif / Ministry for Economic Regeneration (Ministry for Industry) (former name of the Ministry for the Economy, Industry and Digital Affairs)

OECD Organisation for Economic Co-operation and Development / OECD

PIA Programme d'investissements d'avenir / Investments for the Future Programme

PRES Pôle de recherche et d'enseignement supérieur / Research and higher education cluster

PRO Public Research Organisation

R&D Research and Development

R&D&I Research and Development and Innovation

RDI Research Development and Innovation

RENATER Réseau national de télécommunications pour la technologie, l'enseignement et la recherche / Telecom Network for Technology, Education and Research

RI Research Infrastructures

RIS Research and Innovation System

S&T Science and Technology

SATT Sociétés d'accélération du transfert de technologies / Technology Transfer Accelerating Companies – Private Companies

SF Structural Funds

SME Small and Medium-sized Enterprise

SNR Stratégie nationale de recherche / National Research Strategy

SRESR Regional Research and Higher Education Scheme

SRI Stratégie régionale d'innovation / Regional Innovation Strategy

SRR Schéma régional de recherche / Regional Research Layout

SSH Social Sciences and Humanities

SWOT Strengths, Weaknesses, Opportunities, Threats

TFEU Treaty on the Functioning of the European Union

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European Commission

**EUR 27329 EN – Joint Research Centre – Institute for Prospective Technological Studies**

Title: RIO Country Report France 2014

Author: Pierre Bitard

Luxembourg: Publications Office of the European Union

2015– 72 pp. – 21.0 x 29.7 cm

EUR – Scientific and Technical Research series – ISSN 1831-9424 (online)

ISBN 978-92-79-49239-6 (PDF)

doi:10.2791/691199

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doi:10.2791/691199

ISBN 978-92-79-49239-6

